ISSN: 1043-3546

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April • 1991

Vol • 11 • No. 4 • Pages 177-244

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DAIRY, FOOD AND ENVIRONMENTAL

SANITATION

APRIL 1991

A Publication of the International Association of Milk, Food and Environmental Sanitarians, Inc.

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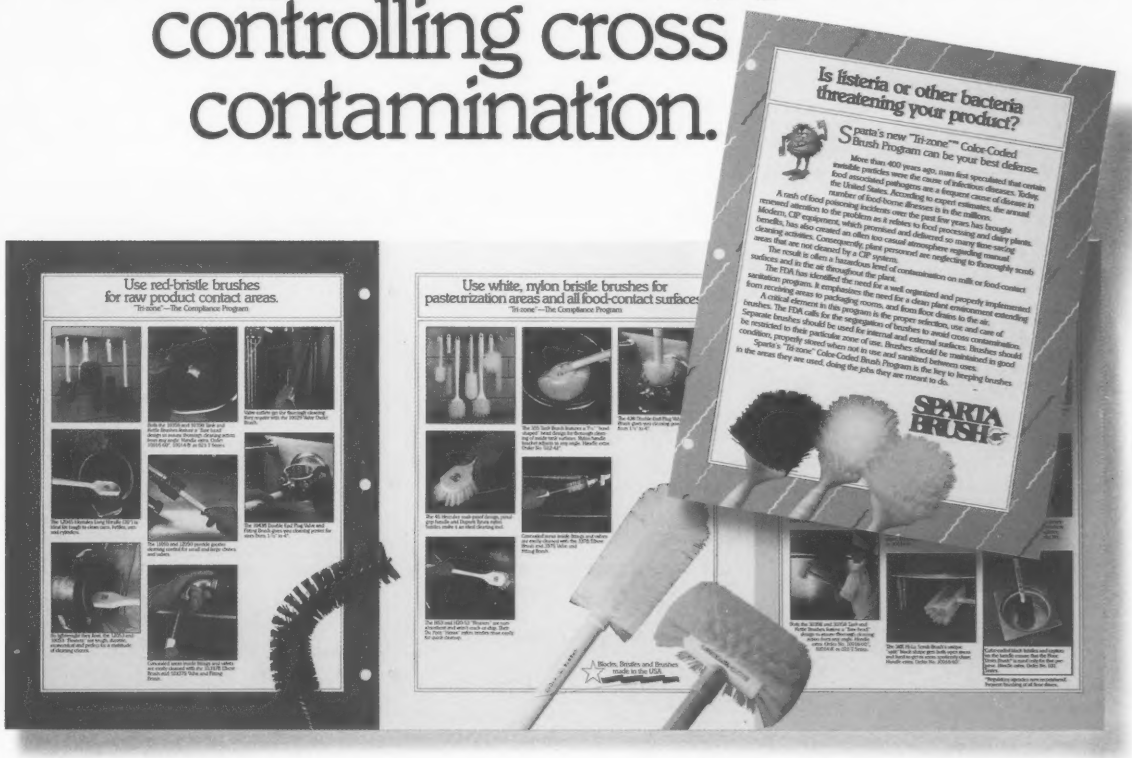
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ABOUT THE COVER . . . *Photo courtesy of New Jersey Division of Travel and Tourism, Branch Brook Park, Trenton, NJ*

Dairy, Food and Environmental Sanitation (ISSN-1043-3546) is published monthly by the International Association of Milk, Food and Environmental Sanitarians, Inc., executive offices at 502 E. Lincoln Way, Ames, IA 50010. Printed by Heuss Printing, Inc., 911 N. Second St., Ames, IA 50010. Second-class Postage paid at Ames, IA. **POSTMASTER**: Send address changes to Dairy, Food and Environmental Sanitation C/O IAMFES, 502 E. Lincoln Way, Ames, IA 50010-6666.

The publishers do not warrant, either expressly or by implication, the factual accuracy of the articles or descriptions herein, nor do they so warrant any views or opinions offered by the authors of said articles and descriptions.

Manuscripts: Correspondence regarding manuscripts and other reading materials should be addressed to Margaret Marble, 502 E. Lincoln Way, Ames, IA 50010-6666. 515-232-6699.

"Instructions to Contributors" can be obtained from the editor.

Orders for Reprints: All orders should be sent to DAIRY, FOOD AND ENVIRONMENTAL SANITATION, IAMFES, Inc., 502 E. Lincoln Way, Ames, IA 50010-6666. Note: Single copies of reprints are not available from this address; address reprint requests to principal author.

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Subscription Rates: $100.00 per year. Single copies $10.00 each. No cancellations accepted. U.S. FUNDS ONLY.

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On My Mind . . .

By
Steven K. Halstead
IAMFES
Executive Manager

. . . Taxes:

After all, it is that time of year. But, I would like to talk about taxation as it relates to your association.

In recognition of the services provided to society by associations, Congress has provided financial incentives in the guise of tax exemptions to encourage the formation and continuation of associations.

There are at least 60,000 associations of one kind or another and seven out of every ten people belong to at least one association.

Associations spend more money on training and educating their members than any one state spends on its entire educational system. Associations are also deeply involved in establishing product and service standards; product safety; professional standards; ethical standards; certification programs; and self-regulation.

Many associations also represent the interests of their members in the legislative arena. The popular press would have us believe that such representation is all evil and selfish, but ask any legislator - he/she will tell you that without lobbyists, there would be no legislation. The lawmakers rely heavily on the information lobbyists have at their disposal. Who knows more about the laws needed to regulate the trucking industry than truckers and their associations? Who knows more about the laws needed to regulate the dental profession than dentists and their association?

Dues and contributions to IAMFES are tax deductible.

Most associations are tax exempt and non-profit. Those terms are a bit misleading.

Tax exempt means that associations don't have to pay taxes on the income realized from those activities which are related to their charitable, educational, scientific and/or religious purposes. They do pay taxes on those activities that are not related to their founding purpose. For example, an association wouldn't be taxed on its dues income, but would on certain income realized by the sale of advertising in its journal. (As you might have guessed, the Internal Revenue Service has the ultimate definition of "related.")

Most associations also make a "profit." That is to say, their income in a given year exceeds their expenses. That excess becomes a reserve which is put away for those rainy days when the association doesn't make a profit or when it makes a major purchase. (Sounds a lot like home, doesn't it?)

One of the difficult things an association manager has to do is to meet the needs of the membership without "giving away the farm." That can be a pretty fine line (and a tough political situation) when faced with a Board of Directors that is more philanthropic than businesslike.

Amongst associations, there are two general categories of tax exemptions - the 501(c)(3) and the 501(c)(6). (These codes refer to the section of the IRS laws that deal with tax exemptions.) IAMFES is a 501(c)(3).

Being a "C-3", IAMFES has the same status as a school or church. That is to say, dues and donations to IAMFES are tax deductible as a contribution to a charity.

On the down side of being a "C-3", we are not allowed to work for or against candidates for public office nor are we allowed to try to influence legislation. That means, because of our tax status we cannot lobby; we cannot have a Political Action Committee; we cannot contribute to a campaign; we cannot use our resources to help a candidate be elected (or defeated).

The prohibition on political activity bothers some people - especially those who want changes in a hurry. But the trade offs seem worth it. I don't know any "C-3" associations which would like to be "C-6s", but I know lots of "C-6s" that would love to be a "C-3."

Taxes - as you pay them, check to be sure that you deducted your IAMFES dues. You're entitled to it.

Thoughts From The President . . .

By
Bob Sanders
IAMFES President

April brings the sights and sounds of spring and the promise of summer. It also brings a near-complete annual meeting program with all it has to offer. Take a look at it and explore the wide range of topics the program committee has put together this year.

A full day symposium on Monday is devoted to dairy farm sanitation. At the same time there are technical sessions on chemical methods of analysis, waterborne microorganisms and a full day for a food service symposium.

Tuesday's morning sessions include a shelf life of dairy foods symposium, a technical session on microbiological methods and, new this year, a symposium on computers. Find out about new computer software and its application for food protection.

The Tuesday afternoon program consists of the general session with the annual business meeting following. Hear some industry overviews at the general session; catch up on what's happening within our organization at the meeting. Take a break from the more technical presentations earlier in the day by attending both these events.

Wednesday takes you back to technical symposiums - on dairy microbiology, water in food processing, laboratory methodology for rapid methods for salmonella and laboratory safety. But, two new innovations, the poster session and the video theater are also scheduled. Thirteen posters have already been scheduled. This is a great start. Help make it successful so that it may be included as part of future annual meetings.

But don't forget about the exhibit hall. Take a break from the technical sessions to visit it. The exhibit area will be open on Sunday evening, during the midday, from break to break on Monday and Tuesday. These are the same hours as last year. Spend a few moments with the various exhibitors to see all they have to offer. Better yet, take part as an exhibitor. Sign up early and reserve a spot. The exhibits are a great help in making our annual meetings a success, as past meetings attest.

Another successful aspect of the meetings are the social events. Following the Ivan Parkin lecture enjoy good food and company at the wine and cheese reception. Monday, cruise on the Ohio River aboard the Belle of Louisville. Wednesday evening, the annual meeting closes with the awards banquet.

I'm sure you will agree that this is a fine program. If you haven't already filled out your registration form, do so now and send it in. Become an active member of the association.

Now for a few of reminders - If you haven't already done so, send in your names of candidates for awards. I'm sure you know some deserving colleague who could be considered for an award. Also, send in your choice of candidates for Secretary and express your opinion on the name change for the organization.

Enjoy the beautiful spring weather. Next month's column will bring you news from the Executive Board spring meeting.

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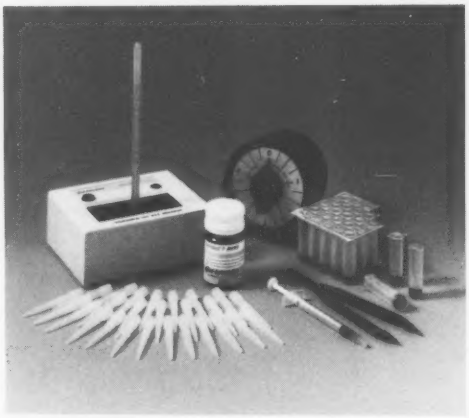

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Carrying Capacity of a 3-Inch Milking Pipeline

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Milking systems operate in two phase flow characteristics during both milking and cleaning. Two phase flow is the combination of air and milk moving through the pipeline simultaneously. Air movement in pipelines is generally turbulent while milk flow is streamline or laminar (4). During cleaning, both fluids are in turbulent flow conditions.

During milking it is considered desirable to avoid flooded sections or plug flow conditions in the pipe for reasons of vacuum stability as related to udder health and minimization of lypolysis. No data are available with regard to the udder health relationship, however, Rabold (7) and Gates et al (3) have shown that plug flow conditions enhance lypolitic activity. The cause of the increase in hydrolytic rancidity development is believed to be due to the shear forces that develop along the boundary layer of the liquid-pipe interface. According to Kosterin (6) the effect of air velocity over the surface of the milk is critical. The first stages of slug formation begin when air drag over the milk at a velocity of about 1 meter per second raises the milk into waves.

In contrast to the milking operation, the pipeline cleaning function relies upon highly turbulent flow conditions to obtain cleaning solution contact with milk contact surfaces and furnish the scrubbing action to remove milk soil. Thus, the objective of milking system piping design is to provide laminar or stratified flow conditions of milk during milking and turbulent flow characteristics while cleaning. These conditions are difficult to predict and control under the wide variety of flow rates encountered in the milking and cleaning process.

The 3A Accepted Practices for the Design, Fabrication and Installation of Milk Handling Equipment (1) were established in 1968 (revised 1977, 1989), in part, to furnish guidelines for pipe sizes in relation to the number of units installed in milking systems, Table 1.

The criteria used for establishing these sizes were that the diameter of the pipe was raised to the power of 2 to determine the maximum number of units per slope. Gates et al. (3) conclude, however, that flow capacity conforms to Manning's equation for open channel flow. At the time of the establishment of these guidelines there were few 2 1/2 and 3 inch and no 4 inch pipelines in use. No tests were conducted to verify these size considerations although the 3A Accepted Practices provide for exceptions with unspecified documentation of adequacy.

Table 1. 3A Accepted Practices, Milking Pipeline Recommendations (1989).

Size of Milking Pipeline Installation	Recommended Maximum Units per Slope
1 1/2 inch	2
2 inch line	4
2 1/2 inch line	6
3 inch line	9

The recommendations of the International Standards Organization (ISO 5707)(2) are based upon length of pipe, expected milk flow and air flow and pipe configuration (single or looped pipe). Vacuum drop is limited to 3 kPa (1 inHg). Kerkhof (5) compiled vacuum drop tables for various pipe sizes and lengths and suggests a limit of 2 cmHg vacuum loss. Each of these conditions permit plug flow conditions and thus are inadequate to maintain stratified flow conditions during milking. In reality, if stratified flow conditions are maintained during milking, there is virtually no loss in vacuum to the milking unit within the milk pipe since air flow rates are very low (ie 0.5 cfm/unit) during milking. Table 2 illustrates the contrast between the recommendations of the 3A Accepted Practices and the ISO Standard.

Table 2. ISO recommendations for the maximum number of units on the milking pipeline (looped pipeline).

Diameter (mm)	Diameter (inches)	Length of pipeline (meters) 50	100	200
		Maximum number of units		
38	1 1/2	8	5	3
50	2	14	10	6
61	2 1/2	-	14	10
73	3	-	20	15

The study by Gates et al. (3) indicated a substantial difference in the flow characteristics of a single and looped pipe configuration. Water was used as the test media. They also present a model to predict pipeline milk flow as a function of number of cows and rate of unit attachment. Their study clearly indicated that current recommendations in the U.S. may result in oversized pipeline diameters.

This study was undertaken to determine the carrying capacity of a 3 inch milk pipeline under actual use conditions. Tests were conducted at Gen Farm 111 in Bell, Florida. This location consisted of 1650 Holstein cows milked three times daily. Milk production was 57.2 pounds per cow with a 19,000 lb RHA at the time of the tests. The milking facility was a double 24 stall parallel parlor with 2

milk receivers. Each receiver was piped with a tandem over-under 3 inch pipe loop with 12 inlets per slope at 58 inches on centers (OC). Pipe length was 68 feet of straight pipe per slope for a total of 136 feet on each side of the parlor. Each loop had 2, 90° elbows adjacent to the receiver and the far end was connected by a close (180°) double elbow. The normal use condition was with 12 units per slope with no resultant problems or flooding indicated. Pipeline slope was slightly under 1 inch per 10 feet of run. Each receiver was equipped with a 3 hp milk pump which delivered approximately 40 gallons per minute.

The vacuum system consisted of three 15 hp water ring pumps, normally operating with two pumps with one on standby. A model 350 Sentinel[1] vacuum control was set at 14.5 in Hg on line. Germania[2] clawpieces and BouMatic[3] pulsators operated at 52 alternating pulsations per minute at a 60-40 ratio front and rear.

The lower pipe section of one side of the parlor was changed to provide 24 inlets on the pipe at 29 inches OC. A 24 inch piece of transparent unitized ferruled polysulfone tubing[4] was installed adjacent to the 90° elbow. A video camera was used to observe the flow conditions when varying numbers of units were attached to the lower pipe. An analog Sentinel[1] vacuum meter was placed under the transparent pipe section to observe vacuum conditions simultaneously with milk flow. An electronic dual strip chart TESA[5] recorder was used to monitor vacuum conditions on the upper and lower pipes of the loop. Observations were made with 12, 16, 18, 20 and 24 units on the single slope of the 3 inch pipeline. As the number of units on the lower pipe were increased, the balance of the units were operating on the upper pipe. For example, if 16 inits were on the upper pipe, 8 units were operated on the upper pipe (24-16=8, 24-18=6 etc.). Four operators placed units on the cows at an average thru-put of 220 cows per hour. Considering that the units were placed at 29 inches on centers and there were four operators, the loading factor on the 3 inch pipe was quite high.

Results

Four groups of 24 cows each were observed with 12, 16 and 18 units per slope. Two groups of 24 cows each were observed with 20 and 24 units per slope. At no time were slugs or plug flow conditions observed at 12 and 16 units per slope. Milk production averaged 74.2 and 77.4 lb per cow in two of the observations at 16 units per slope. Vacuum remained relatively stable throughout the tests with minor perterbations on the milk pipe attributable to pulsator operation, Figure 1. Vacuum drops did not occur during unit fall-off, however, a ripple effect was noted on the surface of the milk. Fill depth of the milk pipe did not exceed 50 percent. Figure 2 shows the transparent pipe section at maximum fill depth with 16 milking units per slope.

The maximum flow rate period lasted from 1.5 to 1.75 minutes after attachment of the last unit in the high producing groups of cows. During this period the 40 gpm pump averaged 61% run time. Thus, the average peak flow rate per cow is estimated at 8.75 pounds per minute. Estimated flow rate is shown in Table 3.

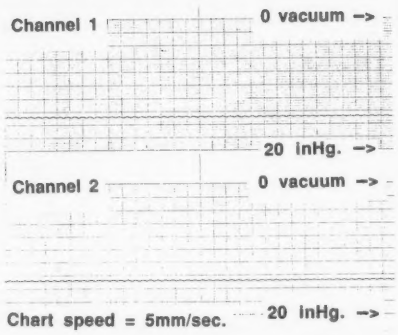

Figure 1. Dual channel recording of vacuum conditions on a 3 inch milk pipe during maximum milk flow. Sixteen units were on the lower pipe being monitored by channel 2 (lower pipe) while 8 units remained on the upper pipe.

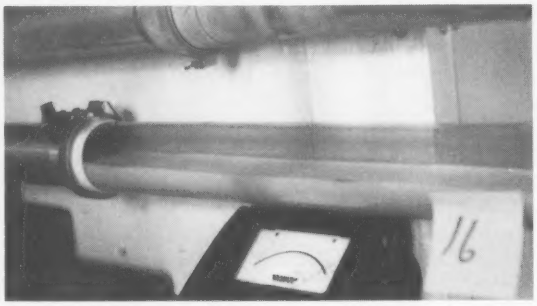

Figure 2. Transparent pipe installed in milk pipe prior to receiver entry with 16 units at maximum milk flow. Mark on pipe above meter is at 50% fill depth.

While milking the low milk production groups, no slugging of milk was noted in the pipe with 18 units per slope, however, when milk production was 77.4 lb per cow, several slugs (6-8) formed during the high milk flow period which normally lasted about 1 1/2 minutes per group of 24 cows. Surprisingly there was no measurable vacuum fluctuation due to slug formation. Unit fall-off produced a vacuum drop of about 1 inch of mercury for less than 1 second. The drop would not be considered a high speed drop in vacuum.

Substantial flooding occurred with 20 and 24 units per slope. Fill depth frequently exceeded 50 percent. The speed and frequency of the flooding was judged to be excessive, however, surprisingly few vacuum fluctuations occurred with 20 units per slope. When 24 units per slope were used, no strip chart measurements were made on the lower pipe since no inlets were available to measure vacuum.

Table 3. Estimated maximum milk flow rate on a 3 inch milk pipe.

Number of units	Flow rate, pounds/min
12	105
16	140
18	158
20	175
24	210

[1]Western Dairy Research, Torrance, CA
[2]Germania Dairy Automation, Inc., Waunakee, WI
[3]Dairy Equipment Co., Madison, WI
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Conclusions

Carrying capacity of a 3 inch pipe was observed under actual milking conditions by the use of a transparent pipe section. No slug formation was observed and fill depth remained less than 50 percent when up to 16 units per slope were used. No vacuum fluctuations were attributable to milk flow patterns under very high loading conditions. When 18, 20 and 24 units were applied per slope to a 3 inch milk pipe the fill depth exceeded 50 percent and frequent milk slugs occurred during periods of heavy milk flow from high producing cows.

We conclude that a 3 inch milk pipe at a slope of 1 inch per ten feet of run can carry the milk from 16 high producing cows without experiencing flooding conditions. These observations closely follow the mathmatical modeling and confirm the conclusions by Gates et al.(3).

Implications

These findings, if put into practice, would make considerable cost savings in pipeline installations and improve cleaning operations. For example, a single receiver assembly and CIP system would be sufficient for a double 16 parlor which is now limited to a double 9. When two receiver systems are installed, a 3 inch single loop on each side of a milking parlor could serve up to a double 32 parlor which is now limited to a double 18. Three inch diameter pipes are easier to clean than 4 inch pipes, the latter being required if the current restrictions remain in effect.

Acknowledgment

This research was funded by a grant from the Florida Dairymen's Milk Checkoff Fund and is sincerely appreciated.

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Dairy, Food and Environmental Sanitation, Vol. 11, No. 4, Pages 189-194 (April 1991)
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Food Safety -- An Overview of Problems

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To place food safety into perspective, we must realize that at-one-and-the-same-time it has health, nutritional, economic and social aspects. American society operates on crises. As a society, if no imminent crises impinge upon us we search for new crises. Particularly we desire crises which have universal appeal, for which there is some scientific basis which can be analyzed, and which can be extrapolated beyond scientific data to permit mass public evaluation and recommendations for action to be taken by others. Food safety is in essence the ideal crisis. With only the tiniest number of exceptions all of us consume food and thus have immediate concerns about it. The processing and distribution of food are now too complex for consumers to relate personally to even a small portion of the chain from macro-producer to microwave oven, from farm to fork. Processor conglomerates are widely believed to have economic and political capabilities to hide rather than to correct deficiencies. Actually there are some valid scientific data that there are infectious disease hazards, carcinogenic chemical hazards, toxic chemical hazards and nutritional excess/deficiency hazards in our food supply. It matters little that overall food safety is being enhanced, because there are specific areas in which hazard analysis either shows no significant change or worsening.

Approximately 6.5 million cases of food-borne diseases of microbiological and parasitic origin are estimated by the Centers for Disease Control to occur in the U.S. each year. They translate into food-borne infectious diseases as approximately 1% of all cases and 3% of all deaths due to infectious diseases in the U.S. This is about one case per 40 women, men and children per year, which would translate into about 15 episodes per person per average lifetime. About 25% of food-borne diseases are traced to meat and meat products as sources. Table 1 shows the data on eight important food-borne infections and intoxications.

Table 2 details the epidemiology of these eight major food-borne diseases. Invariably, some mishandling of the source contaminated foods leads to their occurrence.

Bacillus cereus is a ubiquitous soil-borne spore forming organism. We have found it easy to culture this bacillus from rice which is most often associated with *Bacillus cereus* food poisoning. In one episode we investigated, a popular Chinese restaurant steam cooked rice at midmorning, serving it still hot at noon but allowing it to cool at room temperature during the afternoon; then mixing it with vegetables, meat and shrimp cooking in oil and serving it at dinner. This is a rather typical situation, with the initial cooking of the soil-contaminated food being inadequate to inactivate the spores; then allowing the food to stand for several hours at temperatures fostering the vegetation of the heat-shocked spores and elaboration of enterotoxin; then inadequately reheating to inactivate the heat labile toxin. The clinical disease is dose dependent; at high ingestion levels, incubation can be as short as 10 minutes with cases characterized by vomiting; at low ingestion doses, incubation periods are usually 6-16 hours and cases are characterized by diarrhea. At 5,000 human cases per year, it ranks sixth among the eight food-borne diseases in frequency of occurrence; the disease also occurs in animals but with unknown frequency.

Table 1. Domestic Infections Attributed to Food-borne Sources 1987 Data from Centers for Disease Control

Diseases or Agents	Percent (%)	Cases #	Fatalities (%)	Fatalities #
Bacterial				
Bacillus cereus	100	5,000	0.0	0
Botulism, including infant	90	180	4.0	7
Campylobacteriosis	100	2,100,000	0.1	2,100
Clost. perfringens	100	10,000	1.0	100
Salmonellosis	96	1,920,000	0.1	1,920
Staph. aureus	17	1,513,000	0.08	1,210
Vibrio parahaemolyticus	90	9,000	4.0	360
Yersinia enterocolitica	65	3,250	0.05	2
TOTAL	-	5,560,430	-	5,699

Botulism occurs sporadically in the U.S. as familial and, increasingly with the diminution of home canning, as restaurant-associated, multiple-family outbreaks. More than 45 cases in the U.S. in one year appears to constitute a high incidence; in 1977, 58 people became ill after eating home-canned peppers at a restaurant in Michigan; in 1978, 34 people became ill after eating potato or bean salad at a restaurant in New Mexico. The widely publicized outbreak involving 28 people who ate at a restaurant in Peoria, Illinois in 1983 was associated with sauteed onions. Today's specially bred vegetables like tomatoes are no longer bacteriostatically acidic; and tomatoes, onions, potatoes and other vegetables which are soil contaminated can easily have bruised areas in which anaerobic *Clostridium botulinum* can elaborate its neurotoxin. The Peoria outbreak required use

Presented at the Conference of Research Workers in Animal Diseases for the Continuing Education Symposium on Food Safety, Chicago, Illinois, November 4, 1990.

Table 2. Major Food-borne Bacterial Infections and Intoxications in the United States

Disease	Reservoir	Epidemiology	Incubation	Clinical
Bacillus cereus food poisoning	Soil contaminated foods	Toxin performed in food contaminated with spores	<1-16 hours	Vomiting or diarrhea
Botulism food intoxication	Soil contaminated foods	Toxin preformed under anaerobic conditions	12-36 hours	Weakness, paralysis
Campylobacteriosis infection	Cattle, poultry shellfish	Fecal-oral transmission by milk or foods	3-10 days	Diarrhea
Clostridium perfringens intoxication	Soil contaminated foods	Toxin formed under anaerobic conditions	6-24 hours	Diarrhea
Salmonellosis infection	Infected animals and birds	Fecal-oral transmission by contaminated foods	6-72 hours	Vomiting and diarrhea
Staphylococcal food poisoning	Infected human carriers	Toxin formed saprophytically in foods	1-6 hours	Vomiting and diarrhea
Vibrio parahaemolyticus infection	Seafoods	Saprophytic bacteria contaminated seafoods	4-9 hours	Diarrhea
Yersinia enterocolitica infection	Animal intestines	Fecal-oral transmission by contaminated meat	3-7 days	Diarrhea

of all respiratory support equipment in Peoria and neighboring hospitals and almost depleted the available antitoxin in the entire U.S. In the absence of these two life support approaches, botulism must be expected to be fatal in over 60% of patients. The first symptoms of the intoxication are often inability to focus the eyes, followed by muscle weakness and then paralysis. Death ensues by respiratory paralysis. Botulism from home-canned food usually occurred because heating was inadequate to inactivate contaminating spores, with germination and toxin production during long term storage at temperatures above refrigeration levels. Botulism from freshly prepared foods may occur when initial cooking does not inactivate spores which are then able to germinate, and during holding at least 16 hours at ambient temperatures, to elaborate their toxin. The neurotoxin is heat labile, being inactivated by 3 minutes boiling, but such reheating levels may not be reached.

Campylobacter jejuni is a very important food-borne pathogenic bacterium worldwide. It is very prevalent in the digestive tracts of poultry, cattle, and swine, but appears to cause no or very transient clinical disease in them. Contamination of meat or milk combined with no or inadequate heating of these foods is responsible for most of the approximately 2.1 million cases of watery to bloody diarrhea which occur in people in the U.S. annually. Poultry are the source of 50-70% of these infections. In a study of retail meats, 30% of poultry, 5% of pork chops, 4% of pork sausage and 4% of ground beef were contaminated. Fortunately *C. jejuni* is easily inactivated by cooking.

Clostridium perfringens type A causes food-borne disease quite differently from *Clostridium botulinum*. Very inadequately diagnosed and reported in sporadic cases, *C. perfringens* infections are usually identified in conjunction with group meals, especially holiday meals catered by restaurants or prepared outside of regular food service establishments. Foods contaminated with soil-borne spores survive cooking. During storage in which the foods cool to ambient temperatures and stand with at least a portion under anaerobic conditions and at pH above 4.5, multiplication of the bacteria builds up very high populations which may again sporulate. Following ingestion of this heavily contaminated food, the organisms, already at high levels, multiply further elaborating their enterotoxin. Among 22 confirmed outbreaks reported in the U.S. between 1983 and 1987, 95% of them were associated with improper holding temperatures following cooking. An estimated 10,000 cases occur annually in the U.S. They are associated with acute gastroenteritis with abdominal cramps, but usually no vomiting. In a local outbreak of *C. perfringens* food-borne infection, 44 members of four extended families joined for an Easter brunch last March. After 10-12 hours, the only family member who did not become ill with diarrhea and abdominal cramps had not eaten any gravy with the meal. The diarrhea persisted 8-12 hours; only one patient vomited.

Salmonellosis in the U.S., 96% of which is now considered to be food-borne from animal sources, is generally increasing. The true incidence is very difficult to discern. In 1989, 47,812 cases were reported in the U.S. but CDC estimates that this represents about 2.5% of the actual incidence. Salmonella surveys on carcasses before fabrication have ranged from 74% for beef to 84% for pork to 34% for chickens. Feeds and environment are the principal sources of salmonellae to livestock; feeding pelletized feeds in which salmonellae are inactivated in the heating process reduces but does not prevent salmonella infections in swine. Infected swine become intestinal carriers and quickly shed the bacteria when stressed. Feces readily contaminate transportation facilities and holding pens, leading to contamination of hides, skin, hair and feathers. Thus while tissues remain sterile in live animals and poultry, surface contamination approaches 100% and constitutes the main source of contamination of carcasses. Transporting and holding swine in sanitized surroundings prior to slaughter have not been shown to materially reduce carcass contamination. Increased care during evisceration to reduce contamination by intestinal contents, and hand washing and instrument sanitization between carcasses has reduced contamination levels from 50-63% down to 12-20% but did not eliminate it.

There was an outbreak of *Salmonella heidelberg* infection in Iowa in August, 1988 involving 60 of 73 teachers at a convention hotel. Roast beef was contaminated post-cooking by turkey through an inadequately cleaned slicer and then held under inadequate refrigeration prior to serving. The largest single food-borne epidemic reported in the U.S. involved an estimated >150,000 persons who became ill with *Salmonella typhimurium* infection from contaminated milk produced by a dairy plant in Melrose Park, Illinois in 1985. There were >16,000 cases confirmed by culture, 2,777 patients were known to have been hospitalized and 14 associated deaths were recorded. Faulty pasteurization of 2% low-fat milk, not detected by laboratory tests, permitted fecal-borne contaminating *S. typhimurium* to be distributed in two lots sold to completely unsuspecting consumers.

Since 1976 the occurrence of egg associated outbreaks of *Salmonella enteritidis* infections began to rise dramatically in the New England States, followed by the same trend since 1981 in the Middle Atlantic States. More recently, in April 1989, an outbreak involving 27 cases in Knox County, Tennessee was associated with Grade A shell eggs from a farm in Indiana. The eggs were used by a restaurant to prepare Hollandaise and Bernaise sauces. Grade A shell eggs from the same production flock but a different farm were associated with 1,008 cases in participants at a convention held in Chicago in October of 1990. The U.S.D.A. Salmonella Task Force is now moving ever farther west in its investigation of suspected infected poultry flocks. Because *S. enteritidis* invades the ovaries of infected hens, the organisms are present in the yolks of eggs layed by these chickens, not only on the shells as occurs with fecal contamination, At the production source, the only control measures are detection of the infecting organisms and depopulation of producer, multiplier or genetic flocks as necessary. At consumer level, standard cooking of eggs in Hollandaise or Bernaise sauces, meringue, scrambled eggs or soft boiled eggs may not be adequate to kill *S. enteritidis*, a fact which is further complicated by allowing such eggs and egg-containing foods to stand at room temperature for >2 hours during which the organisms may multiply to highly infectious levels. Bulk quantity pasteurized egg products are available commercially and their use is highly recommended for commercial establishments preparing eggs or egg-containing foods in large quantities.

In England, Spain and the Balkan countries, a specific phage type of *S. enteritidis* designated SE PT-4 is particularly invasive, causing unusually severe illness in infected poultry and people. The strain has been isolated from several human patients following recent entry into the U.S. but so far is believed to have been eliminated without exposing poultry, which so far appear to remain free of SE PT-4.

Staphylococcus aureus, usually of human carrier origin, grows readily in contaminated foods, especially uncured or inadequately cured meats and foods containing milk or eggs, elaborating enterotoxin, some fractions of which are highly heat stable. Staphylococcal food poisoning is common; its projectile vomiting and diarrhea which affect an estimated >1.5 million people in the U.S. annually are most discomforting; but it is usually transient and is life threatening only in patients with other underlying complications. Staphylococcal infections, especially mastitis, are prevalent in livestock, but enterotoxins are elaborated during saprophytic growth in foods, not in infection.

Vibrio parahemolyticus, a marine saprophytic organism most prevalent in northern hemisphere oceans contaminates fish and shellfish, which, if these foods are eaten uncooked or inadequately cooked, may lead to human enteric infections. The infrequency with which such marine foods are eaten in the U.S. is the sole factor in the low incidence of *V. parahemolyticus* infections in this country. Several notable outbreaks have been recorded worldwide, one involving occurrence following serving contaminated seafood on an airplane. Tragedy was narrowly averted when the pilot managed to land the airplane and set the brakes before collapsing. Second to botulism, *V. parahemolyticus* infection characterized by severe watery diarrhea, vomiting and fever, has the highest case fatality rate among these eight food-borne diseases. The incubation period is usually 12-24 hours but may be as short as 4 hours to as long as 4 days.

Yersinia enterocolitica is a common bacterium in the intestinal tracts of both animals and people. Most strains appear to be avirulent, but some, notably 4/0:3, 2/0:9 and 1/0:8 cause watery diarrhea, abdominal pain which mimics appendicitis, vomiting and fever. The bacteria are quite unique in growing at refrigeration temperatures under conditions of very low oxygen tension, but concerns that it would become a major food-borne infection through the advent of boxed beef which may be stored for extended periods under refrigeration in evacuated plastic packaging have not materialized. Fortunately, *Y. enterocolitica* contamination is commonly limited to contaminated surfaces of meats and is quickly killed in curing or cooking.

Listeria monocytogenes is a common bacterium in the intestines of poultry and animals and in soil, frequently contaminating meats and other foods. Sporadic cases of human listeriosis have occurred principally in persons immunosuppressed by organ transplants, AIDS or advanced age. Major human outbreaks have been associated with cheese made from unpasteurized milk or with contaminated garden produce stored under refrigeration. In summer 1985 in Southern California, 142 cases with 47 deaths (10 fetal deaths and 19 stillbirths) occurred in persons who ate an unripened type of cheese made from raw milk. A single case has been reported in an immunosuppressed cancer patient in 1988 in Oklahoma from contaminated turkey franks; uncooked hot dogs and undercooked chicken has been implicated on epidemiological bases in a study in England. Concern over meat as a source of listeria is increasing as developments in meat processing and packaging are leading to substerilizing cooking temperatures, partial elimination of competing spoilage micro-organisms and long shelf life at refrigeration temperatures, all of which may lead to survival and growth of *L. monocytogenes*.

Escherichia coli is almost ubiquitous in the digestive tracts of animals and poultry. The presence of *E. coli* on their carcasses is an indication of fecal contamination; surveys have ranged up to 97% on swine carcasses, 73% on beef carcasses and 81% on chicken carcasses. In addition to their importance as indicator organisms for fecal contamination, *E. coli* carry plasmids which encode for multiple antimicro-

bial drug resistance transferable to gram negative bacteria in the human intestine. Transferable plasmids have been reported in up to 79% of *E. coli* from swine, 39% of *E. coli* from cattle and 58% of *E. coli* from chickens.

An emerging enterohemorrhagic *E. coli* strain, 0157:H7 has been recognized since 1983 as a cause of hemorrhagic colitis and hemolytic uremia in people. It has been cultured from samples of beef, pork and lamb as well as from milk and from bovine feces; ground beef has been implicated as a source of human exposure in two restaurant-associated outbreaks in the U.S., one each in Oregon and Michigan.

Toxoplasmosis is a protozoan disease of carnivorous and omnivorous animals and human beings. Identified worldwide, it is considered to be the most prevalent zoonotic infection in the world. Human infections in otherwise healthy children and adults alike are commonly mild or subclinical. In pregnant women, however, 10-15% of their fetuses will experience severe disease. Approximately 3,000 infants are born with congenital toxoplasmosis each year in the U.S. Toxoplasmosis as a clinical disease is acquiring new importance in immuno-compromised persons. Especially in AIDS patients, it is a cause of fatal encephalitis, with the infection usually developing from reactivated bradizoites pursuant to an earlier exposure.

Toxoplasmosis is commonly transmitted to animals and people alike by ingestion of foods contaminated by oocyst-laden feces of cats, the reservoir hosts of toxoplasmosis, or ingestion of meat, most frequently pork, containing viable bradizoites of *Toxoplasma gondii*. Toxoplasma are highly resistant to inactivation in vivo and in nature, bradizoites in infected swine surviving in tissues for at least 6 months and oocysts in soil for up to one year. Bradizoites in meat are inactivated by holding at -15° C for 3 days or -10° C for 2 days; survival in meat stored at 4° C refrigeration has not been determined.

Swine are considered most likely of all animals to be infected with viable bradizoites, related to their being butchered at young age, usually less than 6 months old. Infection is prevalent in swine. In a recent study in Iowa, serological testing of 2,616 swine in 104 herds yielded an individual seroprevalence of 6.0% and a herd seroprevalence of 51.0%. In the 53 infected herds, 16.4% of breeding swine were positive and 11.3% of finishing swine were positive. Thorough cooking of pork provides the protection which we experience in safely eating pork; adequate washing reduces the hazard posed by contamination of hands and utensils which can occur through handling raw pork. Microwave cooking is less effective than thorough cooking by conventional heat in inactivating bradizoites in tissues. The important emerging safety issue involves treatment of swine carcasses by methods which sterilize trichina but do not inactivate toxoplasma, leading to unwarranted confidence in lightly cooked or raw pork.

Trichinosis, caused by the nematode parasite *Trichinella spiralis*, occurs in sporadic outbreaks both in reservoir swine and in people in the U.S. The general trend in incidence in both has been downward. The maintaining reservoirs are rats, wild rodents, and wild carnivorous and omnivorous animals, including bears. Transmission is by ingestion of viable cysts in muscle, both by animals eating carcasses or scraps of muscle of infected animals and by people eating inadequately cooked meat of infected swine or rarely of other infected animals such as bears, walrus, seals, or whales. Following ingestion and digestion from the cysts, *T. spiralis* causes tissue damage, pain and allergic reactions, generally proportional to their numbers, during maturation in the intestines, during larval migration through body tissues and during encystment in muscle. Control measures are adequate cooking or frozen storage of pork. In the U.S., routine meat inspection does not include examination for trichinosis, but human outbreaks are traced back to source animals and infected herds of swine are depopulated.

The administration of antimicrobial drugs, specifically antibiotics and sulfonamides to animals for any purpose (growth promotion, disease prevention or disease therapy) leads to the accumulation of resistant bacteria in their enteric floras. Antimicrobial drugs are widely used in swine production for all three purposes; at least 85% of swine butchered in the U.S. have received oral antimicrobial drugs. The presence of antimicrobial drug resistant bacteria in these swine poses two health hazards to people handling or consuming their products. Antibiotic resistant bacteria may cross infect people, causing disease which is difficult to treat. Antibiotic resistant nonpathogenic organisms from animals may be passed to people where they transfer antimicrobial drug resistance plasmids to bacteria of the human floras, also potentially compromising therapy. The role of such transfer of resistant bacteria or of their resistance factors from domesticated animals to people has not been shown to be a critical public health problem. However, resistant bacteria may be meat-borne and when food animal carcasses are contaminated by bacteria from their own, or other animal or human floras, exchange of resistance plasmids and multiplication may take place on the carcasses before chill temperatures inhibit further growth.

Surveys of coliform bacteria from animal carcasses have frequently shown them to have higher levels of antibiotic resistance than is characteristic of coliform bacteria in the feces of swine on farms. We have opportunity to study a herd of swine which have received no antibiotics or sulfonamides either subtherapeutically or therapeutically during the past five years. Antibiograms on *Escherichia coli* from these swine are showing levels of resistance in the fecal flora of 45% against tetracyclines but not any against ampicillin. However, resistance levels of up to 85% against tetracyclines and up to 12% against ampicillin are found in *E. coli* cultured from upper segments of the digestive tract. When swine in this study have been subjected to stress, resistance patterns to these two antibiotics increase rapidly and dramatically throughout the segments of the lower digestive tract.

The use of somatotropic hormones in food animals is a subject of current concern—great current concern. Bovine somatotropin is receiving most immediate attention as it is anticipated that licensure by the Food and Drug Administration for use in dairy cattle to promote greater milk production will be granted early in 1991. In a unique move, the FDA released its summary of 30 years of studies on the safety of bovine somatotropin, through a ten-page report published in *Science* in August of 1990. Also in August, an

article was published in the Journal of the American Medical Association affirming the safety of milk from cattle treated with somatotropin. In the meantime, the European Economic Community has embargoed milk from somatotropin-treated cows from importation into member countries; two states—Minnesota and Wisconsin—have passed laws barring use of bovine somatotropin for at least one year. At a future time, the safety of porcine somatotropin to increase musculature up to 25% with reduction in fat up to 40% will be a major subject of concern.

Microbiological standards for meat are a major area of study and discussion. The Secretaries of Agriculture and of Health and Human Services reappointed in March of 1990 the earlier National Advisory Committee on Microbiological Criteria for Foods which had been initially established by the Secretary of Agriculture in 1988. The Committee has so far put forth three major recommendations. The first sets forth the principles of the Hazard Analysis and Critical Control Point (HACCP) System which is currently the basic policy being developed and implemented by the Food Safety and Inspection Service, and also widely by industry. The seven principles of HACCP are: 1) assess hazards associated with growing, harvesting, raw materials and ingredients, processing manufacturing, distribution, marketing, preparation and consumption of the food, 2) determine CCP required to control identified hazards, 3) establish the critical limits which must be met at each identified CCP, 4) establish procedures to monitor CCP, 5) establish corrective action to be taken when there is a deviation identified by monitoring of CCP, 6) establish effective record-keeping systems that document the HACCP plan, and 7) establish procedures for verification that the HACCP system is working correctly.

The second and third recommendations are under study by the Food Safety and Inspection Service and the National Marine Fisheries. The second deals with HACCP applications to refrigerated foods containing cooked, uncured meat or poultry products that are packaged for extended refrigerated shelf life and that are ready to eat or prepared with little or no additional heat treatment. The third recommendation deals with HACCP applications to cooked ready-to-eat shrimp and crabmeat.

The principal sources of micro-organisms, generally bacteria and to a lesser extent viruses, in meats and meat products are threefold: the animals and poultry themselves, the human handlers, and the environment. Under conditions suitable to them, bacteria multiply in the products; viruses do not. Muscle tissues and internal organs classed as edible are sterile in healthy animals. For practical purposes this is known by the consuming public, or at least suspected to be true. Raw, unprocessed meats and meat products are not sterile. This is known by many consumers, suspected by others and comes as a surprise to some. Bacteria and viruses contaminating meats and meat products may be pathogenic, or in the case of bacteria, may be nonpathogenic though they may cause spoilage. Our concerns are to eliminate pathogens and with less health urgency, to inhibit spoilage organisms. Inhibition of spoilage organisms may permit pathogenic organisms to remain, unsuspected by the consumers.

During the past sixteen years, with a class in public health laboratory, we have purchased foods of animal origin at our supermarkets in Ames, Iowa for bacteriologic assay. Selections have been made by the students; over these years, 612 meats and meat products have been among the foods purchased and cultured. The same laboratory protocol has been followed through the years. Standard plate count cultures for aerobic bacteria which can be grown on tryptose agar have been cultured as a measure of overall sanitation of the products. Coliform counts for *Escherichia coli* have been measured as indicators of fecal contamination, considered to be principally from the animals and poultry slaughtered. *Staphylococcus aureus* counts have been measured as indicators of human contamination and potential for elaboration of enterotoxin in multiplying in the products. No other cultures for specific human pathogens were done routinely, and although selected samples were cultured for *Salmonella spp.* and *Campylobacter jejuni*, the numbers of isolates were too small to evaluate. Selected findings in the 612 food samples cultured are shown in the following Figures 1-3.

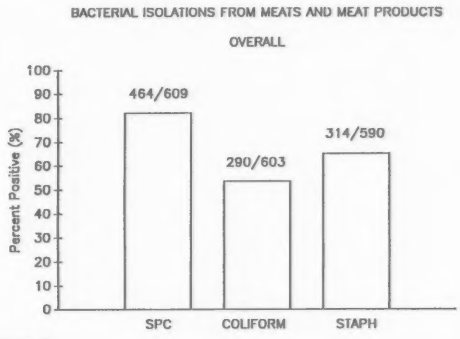

Figure 1.

Rather extensive studies are in progress at Iowa State University on rapid assays for detection of pathogenic or indicator organisms on meat products. A goal has been to develop a latex agglutination procedure that will detect enzymes present in *Escherichia coli* and that can be used to identify the organism in a rapid time frame. Polyclonal antibodies directed individually against the *b*-galactosidase, *b*-glucuronidase, glutamate decarboxylase, and tryptophanase of *E. coli* have been purified on a protein A column and passively absorbed onto white latex particles. Initial tests with pure enzyme preparations and cell lysates of *E. coli* were successful. Currently, similar tests are being conducted on colored latex particles. A different color of latex particle is used for each enzyme, so that multiple enzyme reactions can be determined in a single reaction mixture. The procedure is being optimized by using antibodies purified by affinity chromatography, varying the pH values and ionic strengths of different buffers used to suspend the particles, and titrating latex and cell lysate concentrations. Animals are being obtained to produce additional antibody preparations.

A second goal is to develop a rapid latex agglutination procedure to identify strains of *E. coli* that produce LT toxin. Difficulties have been experienced in obtaining passive absorption of GM_1 gangliosides to polystyrene latex par-

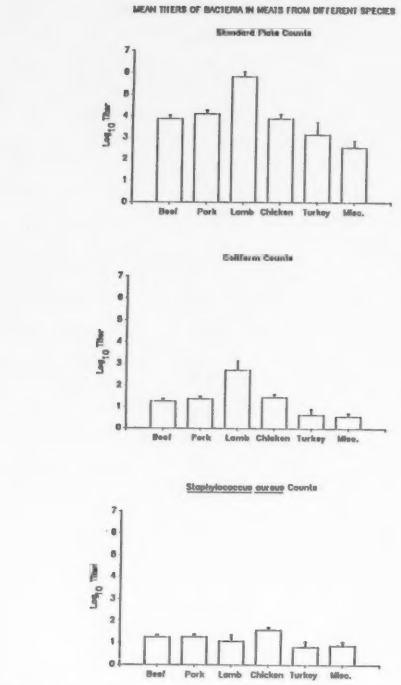

Figure 2.

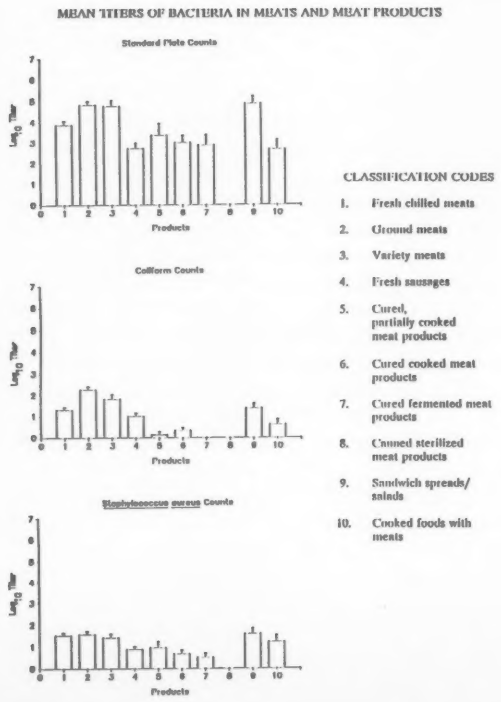

Figure 3.

ticles. A variety of concentrations of ganglioside, buffers, pH values and ionic concentrations have been tested without success. Assays are being developed to quantitate the amounts of ganglioside bound and to develop additional quality control procedures for the toxin preparations used for the latex-agglutination tests. A third goal is to obtain "small" enzymes that would have a variety of applications in diagnostic microbiology. Sixty bacterial and fungal cultures and commercial enzyme preparations have been examined for enzyme activities after filtration through 10,000 molecular weight cutoff membranes. Several xylanases and cellulases, and a *beta*-glucosidase, have been discovered. Positive samples are being concentrated and purified for further study.

Studies in progress on decontamination of cut meats and meat products at Iowa State University are focused primarily on ozonated water and phosphate washes, sharp shell freezing and thawing of product surfaces, acetic and lactic acid washes and on enhanced CO_2 atmospheres in packaged meats.

Residue studies at Iowa State University are primarily on sulfamethazine and sulfadymethoxine drug residues and on aflatoxin and fumonisin mycotoxins in pork.

Future studies will be focused in two important areas. A linear accelerator for food irradiation research will be operational at Iowa State University by April this year. Extensive food irradiation studies are still needed before industry utilization or public acceptance of irradiated foods will be realized. In 1985, the Food and Drug Administration approved irradiation of pork at levels up to 1 kilogray to sexually sterilize trichina but industry has not yet implemented this; nor have adequate studies been carried out on the hazards posed by other infectious agents which may be present in trichina-safe pork which consumers would wish to serve uncooked or only lightly cooked. Irradiation sterilization of poultry has been approved in the U.S. after a six-year study from 1979-1985 by the U.S. Army and USDA in which 600,000 lbs of chicken were fed over several generations to laboratory animals without detectable hazards; but public adoption has not yet come.

The second important area of studies being developed is survival of viruses contaminating meat. This will be an important, related component of irradiation studies to render meats microbiologically safe.

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Pesticides and Food Safety

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Pesticides are any natural or man-made substance intended for preventing, destroying, repelling or mitigating any pests, or use as a plant regulator, defoliant, or desiccant (22). Pests include, but are not limited to, insects, rodents, nematodes, fungi, bacteria, and weeds. Insecticides, fungicides, and herbicides used in agriculture are pesticides as are household and institutional disinfectants. Pesticide regulation involves the interation of several governmental bodies as mandated by a number of legislative acts (7,8,16).

Food Regulatory Agencies and Statutes

Federal regulation of pesticides began with the passage of the Federal Insecticide Act of 1910 which was replaced by the Federal Insecticide Fungicide and Rodenticide Act (FIFRA) in 1947 (7). FIFRA, as amended, is the heart of current pesticide regulation requiring legislation of pesticides prior to their introduction into interstate commerce. In 1954, the Miller amendment to the Food, Drug, and Cosmetic Act (FDCA), linked the goals of the FIFRA and FDCA by mandating the establishment of tolerances for pesticide residues (7). The FIFRA was originally administered by the United States Department of Agriculture (USDA).

In 1970, the Environmental Protection Agency (EPA) was created in response to mounting environmental concerns and assumed jurisdiction over the FIFRA (22). The Federal Environmental Pesticide Control Act (FEPCA) was passed in 1972 and increased the scope of FIFRA. The EPA was required to regulate the use of pesticides and assess their effects on man and the environment (7). This action changed the FIFRA from a consumer protection statute to one requiring consideration of the potential effects of pesticide use on public health and environmental protection.

The FDCA empowers the EPA to establish tolerance limits for pesticide residues on raw agricultural commodities and processed foods and monitor compliance with those limits. The Food and Drug Administration (FDA) retains jurisdiction under FDCA to enforce compliance with EPA pesticide tolerance limits(22). The Food Safety and Inspection Service (FSIS) of the USDA monitors meat and poultry for pesticide residues under the Federal Meat Inspection Act and the Poultry Products Inspection Act (22).

Interpretation of Regulatory Statutes

Over one billion pounds of pesticides are applied on American cropland each year (7). Some pesticide residues will remain on or in raw agricultural commodities through processing. Establishment of tolerances for pesticide residues on raw agricultural commodities used for food is mandated by FDCA. A tolerance is the maximum pesticide residue which may exist in or on a food, feed, or food constituent resulting from the legal agricultural use of the chemical (25). Thus, while most tolerances are established for raw agricultural commodities, the same tolerances are extended to the processed food resulting from the raw ingredients.

Section 408 of the FDCA provides for the seizure of a commodity if the pesticide residues exceed the established tolerance or if pesticide residues are detected for which no tolerance has been established (29). A tolerance may not exist if the pesticide was not registered for use on a particular commodity destined for food. Alternately, the EPA has established a policy for revoking section 408 tolerances and establishing action levels for cancelled pesticides (22). A cancelled pesticide is one for which the EPA registrations have been cancelled, such as DDT and aldrin/dieldrin. This policy is aimed at persistent pesticides (i.e., pesticides which will persist in the environment for a significant amount of time after their cancellation, and can be detected in raw agricultural commmodities, processed foods, and feeds).

Section 409 of the FDCA states if residues of a pesticide are found in higher concentration in any of the food or feed products that may result from processing than in the raw product, the residues in those products with excessive concentrations are considered food additives. Thus, a food additive tolerance must be obtained. This section contains the Delaney Clause which prohibits the use of a food additive which induces cancer in man or animal when ingested. Previous application of the clause centered only on pesticide residues which were concentrated during processing. However, any pesticide, or its metabolites, which are found to be a carcinogen becomes illegal under section 409. The Delaney Clause established the risk of carcinogenicity as a focus of regulatory concern.

Assessment of Cancer Risks

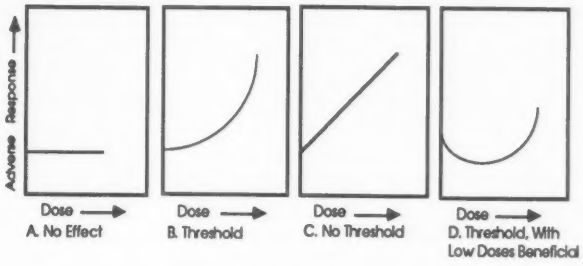
Risk assessment can be divided into two types: scientific and regulatory risks. Scientific risk assessments attempt to estimate true risk through scientific information and methods. While regulatory risk assessments utilize the same information and methods, their purpose is to assure safety. Assurance of safety is based upon procedures and assumptions that collectively overestimate risk (i.e., worst-case assumptions).

Classifying all chemicals that cause tumors as carcinogens is an example of a worst-case assumption. Some tumors are malignant (cancers), while other tumors are

benign (non-cancerous). Defining all tumors as cancers, and therefore all tumor-causing chemicals as carcinogens overestimates the cancer risk for regulatory purposes.

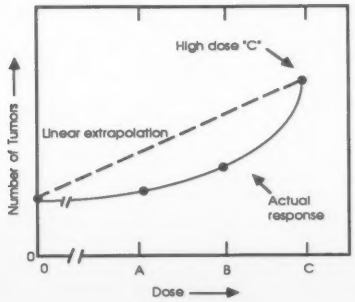
Toxicological studies make use of dose-response relationships in addressing the adverse effects of a chemical. The dose-response relationship is a plot of the adverse effect of a chemical against the dose (27). Figure 1 illustrates four examples of these relationships. The threshold is the dose of a chemical below which harmful effects cannot be measured. Regulatory risk assessment assumes there is no threshold for a carcinogen. This worst case assumption overestimates the adverse effect and adds to the margin of safety. Chemicals which react directly with DNA may produce a straight-line relationship. This is based on the hypothesis that a single molecule of a carcinogen can modify the genetic template of a cell, causing a mass of cancerous cells to develop (3).

Figure 1. Four types of responses to increasing doses of a substance being tested in the diet of animals. By convention, responses considered adverse are plotted above the zero-dose response, and those considered beneficial are plotted below this response. Response A might be obtained by small quantities of an essentially inert substance, such as cellulose. Response B might be obtained by a substance such as arsenic. Response C is the hypothetical linear model often used with chemicals that produce cancer. Response D might be obtained with increasing doses of a nutrient, such as vitamin A, that is required in small quantities but is toxic in larger quantities.



Most carcinogenic compounds require metabolic oxidation to electrophoretic reactants to exert their carcinogenic effects (27). Cancer induction from this class of chemicals results most often when body defense mechanisms are overwhelmed by a relatively large dose of a chemical. The dose-response curve illustrated in Figure 2 describes this response which suggests the existence of a threshold. Linear extrapolation to a straight-line curve, as promulgated by regulatory risk assessment procedures, does not consider this relationship.

Figure 2. An illustration of the difference in number of tumors estimated by a typical response curve and by a linear extrapolation from a high dose to zero dose.



Determination of Carcinogenicity

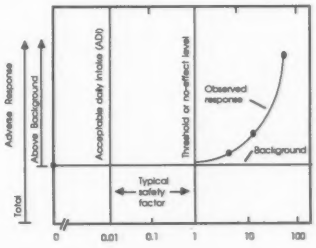
Animal model studies are the cornerstone for determination of a chemical's carcinogenic potential. Mouse and rat models are almost exclusively used for this purpose. Regulatory risk assessment procedures require tumor formation in either of the species to label a chemical a carcinogen. Evidence of carcinogenicity in rodents has been obtained for many chemicals in animal tests. Few, however, have been confirmed as human carcinogens (3).

To assess cancer risk based on animal models, two extrapolations are required. Extrapolation from high dose to low dose and from animals to humans is involved (17). While this model system has identified human carcinogens, the suitability of animal studies for predictive modeling of human carcinogenicity has been questioned by numerous workers (1,3,5,6,16,20). Overestimation of risk in inherent in predictive modeling. Conversely, tobacco smoke and alcohol, two major causes of neoplastic death in the U.S., were not initially detected in standard animal model tests (1).

Acceptable Daily Intake

Acceptable daily intake (ADI) is the estimated dose of a chemical that could be consumed every day for a lifetime without increasing the risk of an unfavorable effect. This figure is devised by dividing the threshold level by a safety margin (2). The safety margin may run from 10 to 1,000 depending on the availability of human data and accuracy of animal data. Figure 3 demonstrates a commonly used safety factor of 100. Note that the ADI is a reference figure used with pesticides for which there is no evidence of carcinogenicity. Use of wide safety margins overestimates potential risk for regulatory risk assessment purposes. Doses greater than the ADI does not imply the existence of a carcinogenetic effect.

Figure 3. The results of a hypothetical experiment in which four similar groups of tests are fed different doses of a chemical.



Determination of Pesticide Residues

Pesticide registrants seeking an EPA tolerance must submit an analytical method suitable for enforcement of the tolerance level (26). These methods are included in the FDA Pesticide Analytical Manual (24). Methods submitted are generally single residue tests in which one pesticide may be detected by the submitted method. Some submitted methods are multiresidue tests which can detect multiple pesticides of similar structure. Multiresidue tests are more efficient, allowing analysts to screen for many similar pesticide compounds in a single analysis. The FDA places great emphasis on developing and using validated multiresidue methods (26).

Early analyses involved paper and thin-layer chromatography, polarography, colorimetry, and microcoulometric gas chromatography (23). Gas chromatographic techniques using electron capture and/or specific detectors (i.e., halogen, nitrogen, phosphorous, and sulfur) are routinely employed, although HPLC procedures are used for the detection of some pesticides (18,21,23). The FDA employes five multiresidue tests in its monitoring program (26). These five methods can determine about one-half of the pesticides with tolerances.

Advances in technology have increased the sensitivity of pesticide analyses. Analytical sensitivities in 1958 (the year the Delaney Clause was passed), were 1 ppm (16). Current methodology allows detection of as low as 0.1 ppb for some substances. Increasing the level of sensitivity 10,000 fold greatly increases the possibility of detecting some level of pesticide residue. As capabilities for detecting smaller amounts of pesticide residue are increased, more products may be found to contain trace levels of carcinogenic compounds as defined by regulatory risk assessment protocol.

Development of new analytical technologies may affect the methods employed in the detection of pesticides. Enzyme-linked Immunosorbent Assays (ELISA) have been successfully applied to the detection of pathogenic bacteria and microbial metabolites (i.e., staphylococcal enterotoxin and aflatoxin). Commercially available kits are available for these assays.

Application of ELISA technology to the detection of pesticides is under investigation. Numerous workers have developed ELISAs for various pesticides (9,10,12,28). While this technology demonstrates promise for the detection of pesticides in foods, application of ELISAs has been primarily successful in aqueous and/or soil samples. Additionally, commercial availability of kits is limited, thus restricting application of ELISA within the food industry.

Food Industry Response

The food industry has no role in the registration process of a pesticide and little influence over the application of pesticides on cropland. Previously, the food industry's role has involved monitoring and surveillance activities of their respective products. While this activity is important and should be continued, additional recourse for the industry is available.

Education of the consumer is critical. However, education for members of the food industry is a priority. The food industry's ability to discern between scientific issues and regulatory responsibilities prior to the passage of pesticide information to the public is imperative. The recent daminozide (Alar) incident is a good example of how knowledge of the issues and the presentation of information to the public is essential.

In February of 1989, the National Resource Defense Council (NRDC) reported children were at risk from eating apples treated with alar. While the apple industry was ill-prepared to refute these allegations, negative media coverage prejudiced public opinion against its eventual response. A subsequent public apology by the NRDC to the apple industry could not offset a severe economic setback (13).

From this episode, the Washington Apple Commission concluded, "It is generally not the nature of the risk that prompts crisis in the marketplace, but rather the nature of the communication" (19).

Changes in regulatory risk assessment have been urged by many parties. Replacing the Delaney anti-cancer clause with a negligible risk policy has been proposed (14). This would require establishment of threshold limits on many pesticides currently without thresholds. Negligible risk policies would serve as a more scientifically valid determination of food safety.

Also related to the Delaney Clause is the adoption of the *de minimis* concept by the FDA. Application of this principle details that if an assessment, based on good science, indicates that the risk of a chemical carcinogen used as a food additive or in other ways is negligible, the use of that substance will not be disallowed (3). Use of this principle is dependent on the magnitude of the risks involved and appears an interim device until more substantive changes are effected.

Criticism of the dependence on animal models for detection of carcinogenetic properties has resulted in evaluation of alternative methods for making this determination. Epidemiological studies previously had minimal application, although many occupational carcinogens were first identified by epidemiological data (16). Advances in molecular biology and a better understanding of cancer induction mechanisms have led to the linking of epidemiological data and cytogenetic analyses. The National Cancer Institute has devoted resources to the development of improved chemical analyses for potential carcinogenetic properties, thereby decreasing the use of animal model studies (27).

Current methodology utilizing single and multiresidue testing protocol is costly and labor intensive. Additionally, well-trained personnel and sophisticated equipment are required for analysis. Development of rapid assays for pesticides has been promoted (15). While limitations to their application in monitoring and surveillance programs exist, particularly for regulatory purposes, rapid assays contain potential advantages over current methodology.

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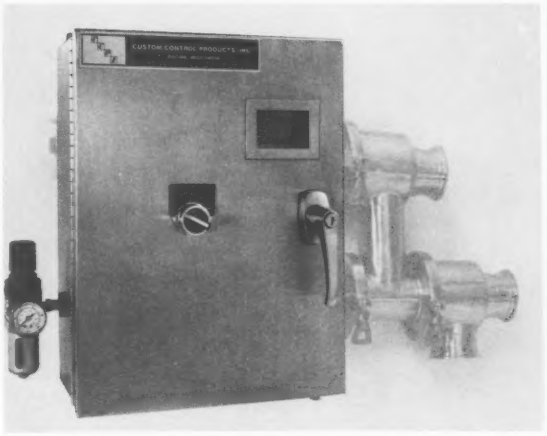

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Reprinted fron SCOPE, A Technical Bulletin from Silliker Laboratories, Vol. V, Issue 3, p. 1-4, September, 1990.

Dairy, Food and Environmental Sanitation, Vol. 11, No. 4, Pages 200-201 (April 1991)
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DDT Persists in Soil: Uptake by Squash Plants

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Abstract

DDT and its metabolites are taken up by squash plants from soil where DDT was last used nearly 20 years ago. The soil contained 280 ppb DDT and 947 ppb of DDE. Fruit averaged 5.6 ppb DDE and 0.9 ppb TDE. Leaves averaged 5 and 0.5 ppb of DDE and TDE, respectively. Stems averaged 29 and 3 ppb of DDE and TDE, respectively. Tests with carrots showed the same concentration relationships.

Introduction

DDT has not been used for agricultural purposes essentially since 1972 when its registration was removed by the Secretary of the Environmental Protection Agency (EPA). Residues of DDT have persisted in the environment for decades (1). Up to three years ago the EPA listed a tolerance for DDT and its metabolites DDE and TDE in a variety of crops. At that time the decision was made by the EPA to remove the tolerance: i.e. zero tolerance (2). The Food and Drug Administration (FDA), however, recognizes that DDT may persist in the soil, and states "Food and feed crops may contain a pesticide residue from sources of contamination that cannot be avoided by good agricultural and manufacturing practices, such as a pesticide that persists in the environment" and thus they established an action level of 3 ppm on most crops (3).

In the course of routine testing fresh fruits and vegetables at this Station (4-6), and testing by the FDA (7), trace concentrations of DDT, DDE, and TDE were found in fresh products, even though the insecticide had not been used in recent years. Studies on the amount of DDT and metabolites found in crops have been documented, but many of these studies were made prior to 1972 when DDT was sprayed directly on the crop (1). How DDT may be metabolized or degraded by biota has been proposed (1), but most studies dealt with animals. It has been shown, however, that plants such as cranberry and rice growing in water take up DDT better than plants growing in dry soil (8).

We report here uptake of DDT and its metabolites from contaminated soil by squash and carrot plants.

Methods

Squash, green (var. Black beauty (Agway)) was planted on May 19, 1989 at Lockwood Farm, Mt. Carmel, CT in soil shown to contain DDT and its metabolites. DDT had not been used in these plots since about 1972. Soil was sampled five times from April 28 through August 25. Squash fruit was sampled five times from July 10 to August 7. Carrots (var. Danvers 126 (Agway)), were planted on May 19, 1989 and harvested on August 7 and 13.

All samples were tested for DDT, DDE, and TDE by FDA methods (9) using gas chromatography with electron capture detection. Concentrations were calculated using a Hewlett Packard integrator. The limit of detection for all compounds is 0.1 ppb. Statistical analyses were made using Epistat statistical computer program.

Results and Discussion

The soil in the test plots averaged 280 ppb of DDT and 947 ppb of DDE; no TDE was detected (Table 1). Soil from control plots did not contain any of these compounds.

Table 1. DDT and metabolites (ppb) in produce grown in contaminated soil.

Matrix tested[a]	DDT	DDE	TDE
Soil(5)[b]	280±186(97-589)[c]	947±475(53-1640)	0
Squash(19)	0	5.6±3.5(3-14)b	0.9±0.9(0-2)
Squash, stems(3)	0	29±6.9(23-39)	3.0±3.0(0-5)
Squash, leaves(2)	0	5.0±1.0(4-6)	0.5±0.5(0-1)
Carrots(2)	0	20+13(7-33)	1.5±1.5(0-3)
Carrot tops(1)	0	9.0	0

[a]Only results of test plots shown. All control plots gave concentrations of zero, i.e. less than detection level.
[b]number of samples.
[c]±standard deviation and range of values.

None of the squash harvested from control plots contained any of the compounds of interest. Squash harvested from test plots did not contain any DDT but averaged 5.5 ppb of DDE and 0.9 ppb of TDE (Table 1). Thus in our tests the plants did not take up DDT *per se* but only the me-

tabolites DDE and TDE, after the DDT was degraded in the soil. No differences were found in the concentration of compounds found versus size between large (689 g average weight) and small squash (208 g average weight). No correlation was found between the amount of rainfall, while the squash plants were growing, and the uptake of DDT compounds by the fruit, leaves, and stems.

As found with the squash fruit, the plant stems did not contain DDT but did contain both DDE and TDE, in amounts higher than found in the fruit (Table 1). Leaves contained DDE and TDE in concentrations at about the same level as found in the fruit. The concentrations of DDE and TDE in squash fruit were always about 50 times less than concentrations of these compounds found in the test soil, and 30 times less than amounts present in the stems (Table 1).

DDE and TDE were found in roots of carrots, 10 and 1.5 ppb, respectively, and in the tops, 9 and 0 ppb, respectively. As expected, concentrations of DDE and TDE in carrot roots were higher than amounts found in squash fruit, since the roots are in direct contact with the soil (Table 1).

Some possibilities exist for the uptake of DDT and metabolites by squash. Either plants do not take up DDT directly from soil or if they do, it is immediately converted to DDE and TDE. We feel the former is more likely since all of these compounds have a low solubility in water, approximately 1.2 uL/L (10), but the change in chemical configuration on degradation may enhance some uptake by the plant. In any case we have shown that DDT continues to persist in the soil for some time and plants will take up trace quantities from soil and translocate the metabolites to fruit.

Since the non edible leaves and stems of these plants take up DDT and its metabolites from soil, the judicious use of this vegetation for compost for growing edible crops should be considered.

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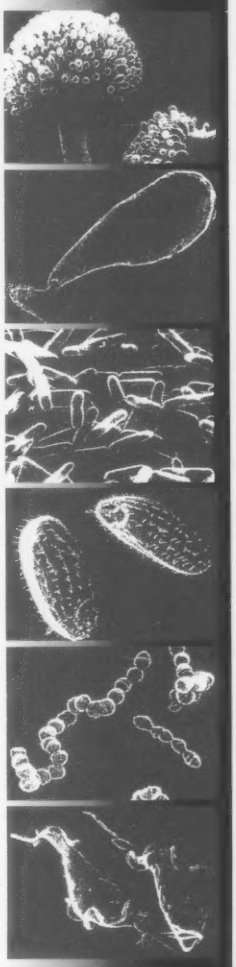

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Dairy, Food and Environmental Sanitation, Vol. 11, No. 4, Pages 202-203 (April 1991)
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The Yogurt Story - Past, Present and Future Part I

Ebenezer R. Vedamuthu, Ph.D.
Microlife Technics, 1833 57th Street, P.O. Box 3917, Sarasota, FL 34230

Introduction

Yogurt is one of the most unique, yet a universal dairy product. The uniqueness of yogurt is attributable to the symbiotic fermentation involved in its manufacture. Yogurt in different forms with different local names are made throughout the world. This fermented milk product probably had its origins in the Middle East and spread westwards into Europe, and towards north into the Slavic and Mongolian republics and to the Southeast into the Indian subcontinent with the migration of herdsmen in search of pasture, water and land to stake out a living. The antiquity of yogurt is established by its mention in early writings such as the *vedas*, the sacred books of Hinduism and in Hindu mythology. Many of the art and dance themes in India depict Krishna (incarnation of the divine Vishnu) frolicking with village maiden carrying earthen pots of yogurt.

In most of Western and Eastern Europe, yogurt is made from cow's milk. In the Baltic regions and the Middle East, milk from goats is also used and in the Indian subcontinent milk from buffaloes, in addition to cow's milk, is used in yogurt production. Yogurt is manufactured and consumed "down under" and has lately caught the fancy of Japanese as a "health and therapeutic" food.

The Yogurt Boom

Although yogurt has a long history, its popularity and phenomenal growth in sales in Western Europe, the United States and Australia-New Zealand has occurred over a relatively short span of the past two decades. The yogurt boom since the 1970's could largely be attributed to the following developments:

1. The use of sweeteners in its formulation - nutritive sweeteners like sucrose (table sugar) and high fructose corn syrup have helped to mute the harsh acid flavor of unsweetened plain yogurt.
2. Introduction of flavor essences like vanilla, rum, etc. and whole or diced fruit, fruit purees, fruit juices and other flavorings have provided variety and choice for individual palates. Addition of cereals and nuts to stirred yogurt have allowed its promotion as an nutritive breakfast food.
3. Inclusion of low-fat and non-fat yogurts containing non-nutritive sweeteners (sugar substitutes) aimed at calorie-conscious populace and those with dietary restrictions (diabetics and those advised the intake of low cholesterol items).
4. Design of attractive, colorful single-serve packages or clusters for yogurt that have high visibility on grocery shelves.
5. Advertising aimed at various calorie-conscious age groups presenting yogurt as a quick, healthy, dietary snack rich in protein and calcium.
6. Accumulation of scientific data which indicate that yogurt consumption could relieve intestinal disorders and lactose malabsorption. Reports have also appeared that show cholesterol reducing effect of yogurt. Evidence pointing to the antagonistic effect of live yogurt bacteria against undesirable intestinal flora is also frequently reported by various researchers around the world.
7. Introduction of frozen yogurt as a low calorie dessert has greatly boosted the volume of yogurt production and sale.

What is Yogurt?

Yogurt may be defined as the solid, custard-like fermented milk product made from fortified high-solids milk using a symbiotic mixture of *Streptococcus salaivarius* subsp. *thermophilus* (coccus) and *Lactobacillus delbrueckii* subsp. *bulgaricus* (rod) as starters.

In the United States, the definition and regulations governing yogurt are set by the Food and Drug Administration. According to FDA, yogurt is the food produced by culturing the following, namely, cream, milk, partially skimmed milk or skim milk either alone or in combination, with a characterizing bacterial culture that contains the lactic acid-producing bacteria, *L. bulgaricus* and *S. thermophilus*. Additionally, the regulations specify that yogurt *before* addition of bulky flavors contains not less than 3.25% milk fat and not less than 8.25% milk solids-not-fat and has a titrable acidity not less than 0.9%, expressed as lactic acid. Three categories of the product recognized are yogurt, low fat yogurt and non-fat yogurt. A product to be labeled yogurt should meet all the aforementioned criteria. Low fat yogurt should meet all the criteria specified for yogurt, but the fat

content should range between 0.5 and 2.0% and should be no lower or no higher than the specified lower and upper limits. Non-fat yogurt should contain less than 0.5% milk fat and meet all other criteria specified for the other two categories. For other approved additives and specifications, the Code of Federal Regulations, volume 21, section 131.200 should be consulted. Standards in individual States in the United States may vary.

In this and following articles on yogurt, the old nomenclature for yogurt starter bacteria namely, *S. thermophilus* and *L. bulgaricus* known generically in the industry as *coccus* and *rod* respectively, will be used for convenience.

See Part II in next month's issue.

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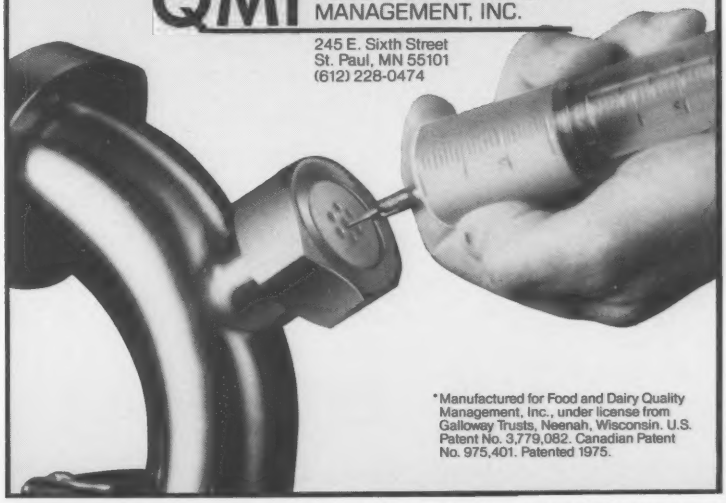

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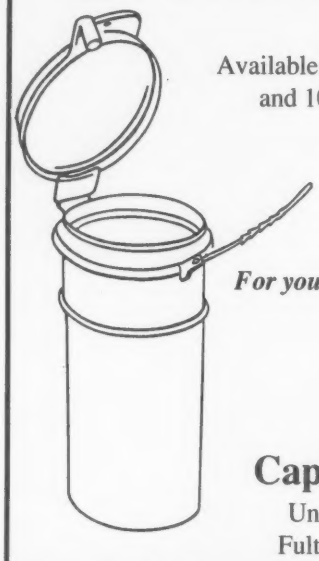

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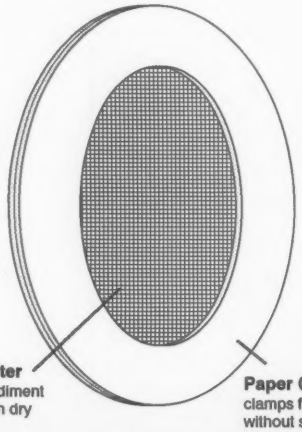

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News

Silliker Laboratories Offers Environmental Sampling Kit

Ensuring the safety of finished products in the processing environment is a major concern of the food industry. Increased governmental regulations and consumer demands for safe products have spurred food processors to minimize the occurrence of microbial contamination in finished products

Responding to the needs of these processors, Silliker Laboratories has produced an Environmental Sampling Kit that can be used to monitor plant sanitation. Raw materials, processing equipment and microbial growth niches embedded in equipment and structural components of the processing plant are common sources of microbial contamination which can affect the safety and quality of finished products. These problem areas can be readily identified utilizing Silliker's environmental sampling kit.

The sampling kit is equipped with instructions providing useful information for personnel who are unfamiliar with Silliker's kit. This information provides not only "how to" guidelines, but suggestions of "where to" sample.

One special feature of the sampling kit are inhibitor-free cellulose sponges. In contrast to some commercial sponges, the cellulose sponges in the Silliker kit do not contain preservatives which can hinder the detection and proper enumeration of microorganisms. The inhibitor-free cellulose sponge is also more effective than the traditional swab method under some circumstances. For example, on heavily soiled surfaces, the sample obtained with a swab may not reflect the true microbial load. Further, only a relatively small area may be sampled with each swab and limited pressure can be applied to a swab. The sponges can be purchased on an individual basis.

The environmental sampling kit includes appropriate packaging materials for proper maintenance and transport of samples. Samples are shipped to the nearest Silliker affiliate laboratory for analysis.

Headquartered in Chicago Heights, IL, Silliker provides chemical and microbiological analyses, technical and consulting, research and informational services related to the safety, stability and nutritional value of food. Silliker laboratories are located in Chicago Heights, IL, Columbus, OH, Garwood, NJ, Stone Mountain, GA, Sinking Spring, PA, Carson, CA, Hayward, CA and Mississauga, Canada.

For additional information on Silliker Laboratories Environmental Sampling Kit, contact Peg Exo, manager of sample administration, Silliker Laboratories of Illinois, Inc., at (708)756-3210, or contact the Silliker lab nearest you.

NFI Announces Spring Conference and Board Meeting

Where Does Industry Stand on Critical Issues?

The National Fisheries Institute (NFI) 1991 Spring Conference and Board Meeting were held on April 14 to 16 at the Hilton de Palacio del Rio in San Antonio, Texas.

Among the issues discussed at the Conference were:

The Environment: Fisheries are now being threatened in order to protect marine mammals--pollock allocations may be cut to protect stellar sea lions and shrimp production may be dramatically affected by sea turtle protection programs. The United Nations is also scheduled to meet in 1992 to set a "World Environment Agenda."

Seafood Safety and Inspection: Will there be a Mandatory Seafood Inspection Program? Which agency will be responsible? Who will end up paying for the inspection program? What has been or will be the impact of the National Academy of Sciences Report on Seafood Safety, especially with regard to environmental contaminants? How is FDA planning to use the $9 million appropriated for seafood inspection? And what about the proposed seafood plant registration fees?

Fisheries Management: How is the industry going to respond to future, California-style gillnet bans? How should tuna and swordfish be allocated? How can we resolve by-catch issues? Can the recreational fishing industry be satisfied?

Seafood Marketing: Does the fish and seafood industry need national, generic marketing? Is the industry ready to pay for a marketing program? Should NFI lobby for an industry referendum on seafood marketing? Would the loss of the National Fish & Seafood Promotion Council change NFI's role in generic seafood marketing?

These are all issues of vital importance to the future of the fish and seafood industry and the time has come to make decisions. Among the speakers who participated in the discussions of these issues were William W. Fox, Jr., administrator of the National Marine Fisheries, the U.S. Department of State, the Food and Drug Administration and the recreational fishing industry.

For more information, please contact the NFI Communications Department, 1525 Wilson Boulevard, Suite 500, Arlington, VA 22209, (703)524-8881.

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Since 1978, the rapid Charm Test for beta-lactam drugs has been the industry standard. In 1983, the system's capabilities were expanded to include the following antimicrobial drugs: sulfa drugs, tetracyclines, macrolides, aminoglycosides, novobiocin and chloramphenicol.

In 1990, the quantitative Charm Aflatoxin Test, as well as an alkaline phosphatase test, were added to the Charm II System. 1990 also saw the introduction of the Charm Farm Test, which allows comprehensive antimicrobial drug testing to be done both in the field and by the veterinarian. Developments in early 1991 include a one hour microbial inhibition assay for beta-lactams and tetracyclines which can be performed on any Charm Test system.

Charm Sciences Inc. will retain the same address, phone number and fax number: 36 Franklin St., Malden, MA 02148-4120 Tel: (617)322-1523 Fax: (617)322-3141.

Jack George Appointed Vice President To A Division Of Cherry-Burrell

Jim Dahlke, Vice President & General Manager of the Cherry-Burrell Fluid Handling Division to include Waukesha Pumps, Cherry-Burrell and Superior Stainless pumps, valves and fittings, located in Delavan, Wisconsin, is announcing the appointment of John H. (Jack) George as Vice President-Finance to the Fluid Handling Division offices.

Mr. George joins us from previous experience with a medical instruments company located in Wisconsin as the Vice President Finance & Chief Financial Officer. He earned a Bachelor of Business Administration Degree from the University of Wisconsin-Whitewater, an MBA from the University of Wisconsin-Oshkosh and is an Executive Program Graduate from the University of Wisconsin-Madison.

His responsibilities as Vice President of Finance include all facets of general accounting, cost accounting, credit collections, M.I.S. strategic planning and financial matters.

Jack lives with his wife Mary in Delafield, Wisconsin.

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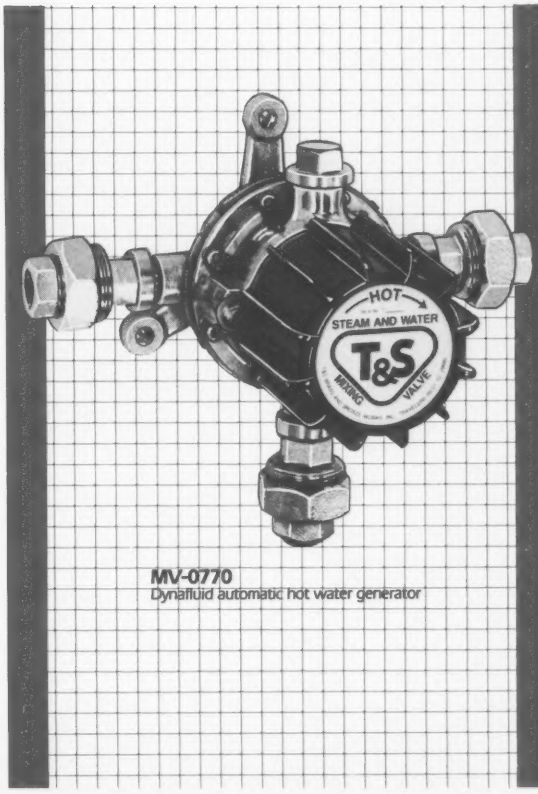

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Updates . . .

Michael Doyle

Michael Doyle is new Head of Food Science

Dr. Michael Doyle has been named the new head of the Department of Food Science and Technology at The University of Georgia's Georgia Experiment Station in Griffin, GA. Doyle was formerly Wisconsin Distinguished Professor of Food Microbiology at the University of Wisconsin in Madison.

Doyle's appointment includes both research and administration. At the University of Wisconsin, he was involved in significant research on bacteria that cause foodborne illnesses.

His research contributed to developing a method for quickly detecting and isolating enterohemorrhegic *Escherichia coli*, which can cause kidney disease, severe diarrhea, and death. His work has also led to the discovery of a group of bacteria that reduce colonization of chicks by Campylobacter.

Doyle is a former winner of the Samuel Cate Prescott Award for Research given by the Institute of Food Technologists. He is a member of IFT, the American Association for the Advancement of Science, the American Society for Microbiology, and Vice President of the International Association of Milk, Food and Environmental Sanitarians, Inc.

He is a native of Madison and obtained his B.S., M.S. and Ph.D. at the University of Wisconsin-Madison. He had been on the faculty at Wisconsin for 11 years. Prior to that, he worked for two years as a microbiologist for the Ralston Purina Company in St. Louis, Missouri.

Ontario Food Protection Association 1991 Spring Workshop

The Skyline Hotel
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HACCP in Action

The Ontario Food Protection Association will hold a Spring Workshop April 24, 1991 at The Skyline Hotel, Toronto, Ontario. For more information, call Technical Services at (416)922-5100.

3-A Sanitary Standards Committees Meeting Set

The 3-A Sanitary Standards Committees meeting, to review tentative standards for the sanitary design of dairy processing equipment, has been slated for May 13-17, 1991, at the Grand Hotel in Milwaukee, Wisconsin. At these meetings, the IAMFES Committee on Sanitary Procedures (CSP) and the United States Public Health Service (USPHS) is scheduled to review 15 tentative standards. The Sanitary Standards Subcommittee of the Dairy Industry Committee (SSS-DIC) and the Dairy and Food Industries Supply Association's Task Committees will have 10 tentative documents for review. For further information on this meeting, contact Dr. Tom Gilmore, Secretary, 3-A Sanitary Standards Committees, at 301-984-1444.

Just a Reminder!

Remember to send in your IAMFES Secretary Nomination and Name Change Ballots by May 15, 1991. Your vote is very important! Also, make sure to take a look at the Preliminary Program in this issue and make plans now to attend the 78th Annual Meeting of the International Association of Milk, Food and Environmental Sanitarians, Inc. in Louisville, Kentucky, July 21-24.

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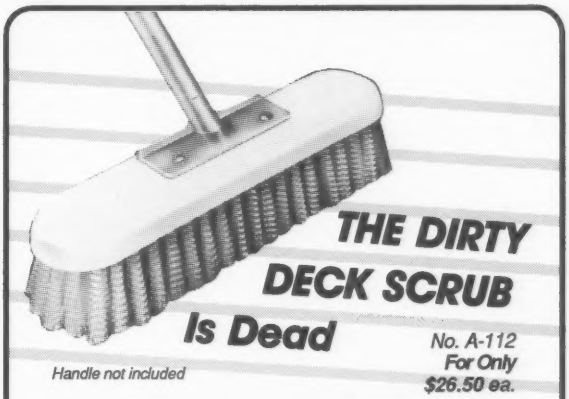

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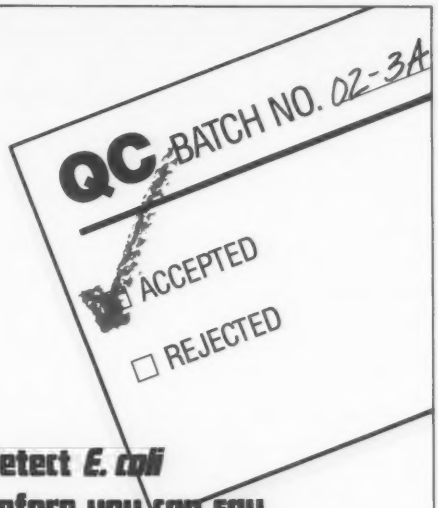

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Federal Register

Safeguarding Food From Contamination During Transportation

Summary: Public Law 101-500, "Sanitary Food Transportation Act of 1990" (SFTA), requires the Secretary of Transportation (the Secretary) to issue regulations to ensure that food and other consumer products are not made unsafe as a result of certain transportation practices. The purpose of this notice is to request public comment.

Supplementary Information: On November 3, 1990, the President signed the "Sanitary Food Transportation Act of 1990" (SFTA: Pub. L.101-500), which requires the Secretary to promulgate regulations to promote the safe transportation of food products. SFTA was enacted in response to Congressional findings that : (1) Americans are entitled to receive food and other consumer products that are not made unsafe as a result of transportation practices; (2) the American public is threatened by the transportation of products potentially harmful to consumers in motor vehicles and rail vehicles which are used to transport food and other consumer products; and (3) the risks posed by such transportation practices are unnecessary, and such practices must be terminated. Congress expressed concern relative to practices including the transportation of wastes or potentially harmful nonfood products in the same motor vehicles that carry food products and the backhauling of chemicals or other potentially harmful nonfood products in cargo tanks, rail tank cars and tank trucks that also haul food products.

Summary: The following is a summary of several sections of SFTA:

1. Section 4 of SFTA requires the Secretary, in consultation with the Secretary of Agriculture, the Secretary of Health and Human Services, and the Administrator of the Environmental Protection Agency, to issue regulations with respect to the transportation of food, food additives, drugs, devices, and cosmetics, as defined in the Federal Food, Drug, and Cosmetic Act (hereinafter referred to collectively as "food products"), in motor vehicles or rail vehicles which are used to transport either refuse or nonfood products that could make food unsafe to the health of humans or animals as a result of such transportation.

2. Section 4 of SFTA requires, for motor and rail vehicles, cargo tanks, rail tank cars, and tank trucks, the issuance of regulations for: (a) Appropriate recordkeeping, identification, marking, certification (i.e., communication standards) or other means of verifying compliance; (b) appropriate decontamination, removal, disposal, and isolation procedures; and (c) appropriate materials of construction for cargo tanks, rail tank cars and tank trucks, and their ancillary equipment, that haul food products.

3. In issuing regulations under SFTA, the Secretary is to consider the extent to which packaging or similar means of protecting and isolating commodities are adequate to minimize or eliminate the potential risks of transporting food products in vehicles used for nonfood products. If the packagings are found to be adequate, the regulations issued shall not apply to the transportation of such packaged products.

4. Section 5 of SFTA prohibits the transportation of food products in cargo tanks, rail tank cars and tank trucks that are used to transport nonfood products that would make food unsafe to the health of humans or animals. The Secretary is required to publish a list of acceptable nonfood products that may be transported in such vehicles. The regulations also must provide permanent marking of food grade cargo tanks, rail tank cars and tank trucks; restrict the use of such vehicles to food products and listed acceptable nonfood products; and prohibit any person from receiving, except for lawful disposal purposes, any food product or listed acceptable nonfood product that has been transported in violation of these provisions.

5. Section 6 of SFTA prohibits the transportation of food products in motor vehicles and rail vehicles that are used to transport unacceptable nonfood products. The Secretary is required to designate and publish a list of unacceptable nonfood products that may not be transported in these vehicles.

6. Section 7 of SFTA requires that, despite any decontamination, removal, disposal, or other isolation procedures, dedicated motor vehicles and rail vehicles be used for the transportation of asbestos, in forms and quantities determined by the Secretary to be necessary, and other products that present an extreme danger to the health of humans or animals.

Dates: Comments [were to] be received on or before March 26, 1991.

Addresses: Copies of SFTA may be obtained from the Superintendent of Documents, Government Printing Office, Washington, DC 20402-9371 (202)275-2091. Comments to this ANPRM should be addressed to the Dockets Unit, Research and Special Programs Administration, U.S. Department of Transportation, Washington, DC 20590. Comments should identify the docket and be submitted, if possible, in five copies. Persons wishing to receive confirmation of receipt of their comments should include a self-addressed stamped postcard showing the docket number (i.e., Docket FS-1). The Dockets Unit is located in Room 8419 of the Nassif Building, 400 Seventh Street, SW, Washington, DC 20590. Telephone: (202)366-5046. Public dockets may be reviewed between the hours of 8:30 a.m. to 5 p.m., Monday through Friday.

For Further Information Contact: John A. Gale, (202)366-4488, Office of Hazardous Materials Standards or Edmund J. Richards, (202)366-0656, Interagency Coordinator for Hazardous Materials Safety, RSPA, U.S. Department of Transportation, 400 Seventh Street SW., Washington, DC 20590.

Federal Register, Vol. 56, No. 34, Wednesday, February 20, 1991.

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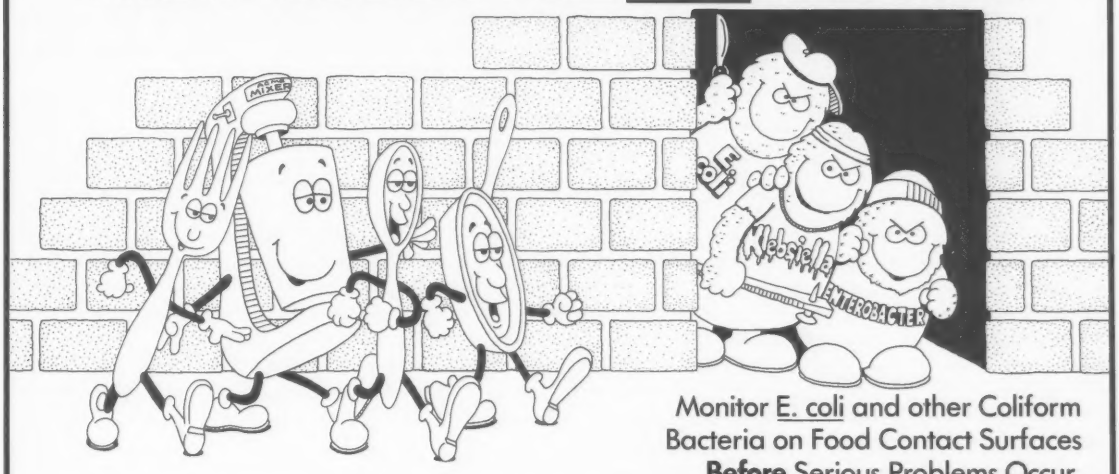

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Food and Environmental Hazards to Health

Update: *Salmonella enteritidis* Infections and Shell Eggs - United States, 1990

From January through October 1990, state health departments reported 49 outbreaks of *Salmonella enteritidis* (SE) in the United States to CDC. This report summarizes three SE outbreaks in 1990 that were associated with shell eggs.

Cook County, Illinois. During October 1-3, at least 435 (23%) of 1900 persons from 30 states who attended a convention banquet in Chicago on September 30 became ill with gastroenteritis and sought medical treatment. Of the 435 ill persons, 147 (34%) were hospitalized. Cultures from 245 persons yielded SE; of five isolates tested for phage type, all were type 8.

The Chicago Department of Health obtained case histories from 92 ill and 55 well persons who attended the banquet; bread pudding with vanilla sauce was implicated as the most likely vehicle for SE. Of the 92 ill persons, 89 (97%) ate the pudding, compared with 24 (44%) of the 55 well persons (odds ration = 38.3; 95% confidence interval [CI] = 10.0-173.0); no other foods were associated with illness. The implicated dessert was prepared with grade AA shell eggs and may have been undercooked. In addition, the dessert was left at room temperature for 1-4 hours between cooking and serving.

The eggs were traced to one farm, and SE was isolated from environmental samples of all six chicken houses tested. The sale of fresh eggs from this farm has been restricted, and all eggs from these six houses are being pasteurized.

Fayette County, Kentucky. In August 1990, 42 (65%) of 65 persons became ill with gastroenteritis following a restaurant brunch for a wedding party on August 11. Twenty-three ill persons sought medical care; four were hospitalized. The median incubation period was 28 hours. Stool cultures from seven patients yielded SE; all five SE isolates tested were phage type 8.

Eating eggs benedict with hollandaise sauce was the only food exposure statistically associated with illness. Of 45 persons who ate this food, 38 (84%) became ill, compared with three (23%) of 13 who did not (relative risk = 3.7; 95% CI = 1.4-10.0). Review of foodhandling practices at the restaurant indicated that eggs used in the hollandaise had been pooled, incompletely cooked, and served >1 hour after preparation.

The eggs were traced to a large midwestern farm. Cultures of environmental specimens from chicken houses on the farm yielded SE, phage type 8. The sale of fresh eggs from this farm has been restricted, and all eggs from chicken houses with positive environmental cultures are being pasteurized.

Cocke County, Tennessee. In late October 1990, six members of two east Tennessee families (A and B) had onset of abdominal cramps and diarrhea; three were febrile, and three required hospitalization. Stool cultures obtained from four of these persons yielded SE. The only exposure common to both families was homemade banana pudding (containing eight shell egg yolks) with a meringue topping (containing eight shell egg whites) prepared by a member of family A on October 25. The pudding was heated for 30 minutes, and the meringue was briefly broiled. All three members of family A ate a portion of the pudding on October 25 and subsequently developed gastrointestinal symptoms (mean incubation period: 30 hours); none required hospitalization.

The pudding was kept refrigerated except for the 1-hour drive to the home of family B. The three members of family B ate the pudding on October 29 and 30; however, their illnesses were more severe than those of persons in family A, their incubation periods were shorter (mean incubation period: 13 hours), and all three required hospitalization. The eggs were traced to a large midwestern farm. An investigation of the farm is pending.

Editorial Note: From 1976 through 1989, isolation rates of SE increased in general in the United States. In 1989, the 8340 SE isolates reported through the *Salmonella* Surveillance System represented 20% of all reported *Salmonella* isolates. SE is the second most frequently reported *Salmonella* serotype. In 1989, 8549 *S. typhimurium* isolates were reported; historically, this has been the most frequently reported serotype, accounting for 21% of isolates in 1989.

During 1985-1989, state and territorial health departments reported 244 SE outbreaks, which accounted for 8607 cases of illness, 1094 hospitalizations, and 44 deaths. Of the 109 outbreaks in which a food vehicle was identified, 89 (82%) were associated with shell eggs. From January through October in both 1989 and 1990, 49 outbreaks were reported. Four (8%) of the 49 outbreaks reported in 1990 occurred in hospitals or nursing homes, compared with 20 (26%) of 77 outbreaks in 1989. The decrease in hospital- and nursing home-associated SE outbreaks may reflect efforts to improve food safety in these settings (in particular, using pasteurized eggs). Although infections with SE first emerged as a public health problem in the New England and mid-Atlantic regions, 22 (45%) of the 49 outbreaks reported in 1990 occurred outside these areas.

In January 1990, five states began electronic transmission of laboratory-based *Salmonella* surveillance data to CDC using the Public Health Laboratory Information System (PHLIS). This system will replace the current method of transmitting laboratory-based surveillance data by mail, thereby facilitating timely epidemiologic analysis and dissemination of these data. From January through June 1990, these five states reported 1517 isolates of *Salmonella* through the PHLIS, of which 334 (22%) were SE. During this period in 1989, these states reported 1721 isolates of *Salmonella* to the *Salmonella* Surveillance System, of which 439 (26%) were SE. In addition to the outbreak surveillance reports, the preliminary reports of isolates are consistent with minimal changes in the occurrence of SE infection in 1989 and

1990; this pattern could reflect either secular variation in the epidemic or the possible effects of control measures.

Most cases of SE infection occur as sporadic cases or in limited family outbreaks, such as the Tennessee outbreak reported here, and not as part of large commonsource outbreaks. Many of these sporadic cases and limited outbreaks may be associated with consumption of contaminated eggs that have been insufficiently cooked to kill *Salmonella*. Therefore, the occurrence of infections acquired by eating foods prepared in the kitchens of private homes might be reduced by improved education of consumers regarding the risks of eating raw or undercooked eggs and by increased availability of pasteurized eggs. To reduce the risk for SE infection in other settings, such as nursing homes and hospitals, pasteurized egg products should be used in recipes that call for undercooking or pooling of eggs. Similarly, commercial food service establishments can reduce the risk of outbreaks by using pasteurized egg products in such recipes.

An estimated 0.01% (i.e., one in 10,000) of shell eggs contain SE. Consequently, foods containing raw or undercooked eggs (e.g., homemade eggnog, hollandaise sauce, and caesar salad dressing) pose an occasional risk of infection with SE. The likelihood of serious morbidity or death as a result of infection with SE is greatest among very young, elderly, or immunocompromised persons; these persons should be especially careful not to eat foods containing raw or undercooked eggs. Commercial eggnog is made with pasteurized eggs and is safe.

To address the public health problem of SE, two major control measures have recently been implemented. First, on February 16, 1990, the U.S. Department of Agriculture (USDA) began investigating layer flocks of hens that are epidemiologically implicated in outbreaks of human illness. Interstate movement of eggs from flocks found to be infected with SE (by culture from chickens' internal organs) is restricted, and eggs are diverted to pasteurization plants or the flock is destroyed. Second, in August 1990, the Food and Drug Administration revised the Model Retail Food Safety codes to include eggs as a potentially hazardous food. The revised code recommends that eggs (which had previously been exempt from federal time and temperature regulations that applied to other foods of animal origin) be refrigerated during storage. In addition, food service establishments are advised not to serve raw or undercooked eggs, to substitute pasteurized eggs for pooled eggs when possible, and to serve pooled eggs immediately after cooking.

To help characterize sporadic cases and to assist in epidemiologic investigations, *Salmonella* isolates should be serotyped by state public health laboratories. Clinicians and microbiologists are encouraged to report cases of *Salmonella* infection to state and local health departments. When SE outbreaks occur, notification of CDC and the USDA through state health departments will promote identification of contaminated eggs and implementation of control measures.

MMWR 12/21/90

FDA Urges Firmer Egg-Handling Standards

To curb outbreaks of salmonellosis caused by contaminated eggs, FDA last September mailed notices urging more stringent egg-handling standards to the food industry and state and local health and food protection agencies.

Scientists believe the *Salmonella enteritidis* organism can sometimes be transmitted during ovulation from the hen to the inside of the egg before the shell forms. (See "*Salmonella Enteritidis*: From the Chicken to the Egg," in the April 1990 *FDA Consumer*.) For this reason, FDA recommends redesignating intact shell eggs as a "potentially hazardous food," a technical term that does not imply a food in inherently unhealthful but, rather, identifies foods requiring proper refrigeration, cooking and handling.

Other foods so designated include most meats, poultry, fish, dairy products, and cooked vegetables. Generally, state and local regulatory agencies can establish refrigeration and cooking requirements only for products with this designation.

FDA recommends that retailers refrigerate raw shell eggs at 45 degrees Fahrenheit or less until sold or used. Recommendations aimed particularly at restaurants and other food service operations include:

- Do not use raw eggs in uncooked, ready-to-eat menu items.
- Substitute pasteurized eggs and egg products for shell eggs in recipes that traditionally call for raw eggs, such as Caesar salad or uncooked hollandaise sauce.
- Avoid mixing and pooling raw eggs in a container (for scrambled eggs, omelets, and French toast, for example) except for immediate use.

As a rule of thumb, FDA advises scrambling eggs until firm throughout and cooking whole eggs until the white is completely firm and the yolk at least begins to thicken. FDA, Cornell University, the American Egg Board, and the Egg Nutrition Center recommend the following cooking times:

- *Scrambled* - 1 minute at medium stove-top setting (250 F for electric frying pans)
- *Sunny side* - 7 minutes at 250 F, or cook covered 4 minutes at 250 F
- *Fried, over easy* - 3 minutes at medium setting (250 F) on one side, then turn and fry 2 minutes on the other side
- *Poached* - 5 minutes in boiling water
- *Boiled* - 7 minutes in boiling water

FDA Consumer, December 1990

Workplace Exposures to Corrosion-Inhibiting Chemicals from a Steam Humidification System - Ohio, 1988

On December 5, 1988, at 11:45 a.m., boiler steam was released to humidify an electrical components manufacturing plant in Ohio. At noon, employees returning from lunch noticed an odor described as musty, pungent, "ammonia-like," or "radiator-like," and the work area was evacuated. During the next several hours, 77 (64%) of the 121 employees working in the plant became ill; symptoms included rapid onset of headache; nausea; vomiting; dizziness; and eye, nose, and throat irritation. Forty employees were evaluated by the company nurse; 11 of these received further

examination at local hospitals but were subsequently released. The steam humidification was turned off in most work areas by 1:15 p.m.

On December 8, boiler steam was reintroduced into the work area, producing the same odor and resulting in evacuation of affected areas; no illnesses were reported. Company management and the local union jointly requested an investigation of the problem by CDC's National Institute for Occupational Safety and Health (NIOSH). Investigators determined that during the third week of September, two corrosion-inhibiting chemicals, diethylaminoethanol (DEAE) and cyclohexylamine (CHA), had been added to the boiler water at four times normal strength, as recommended by the supplier; the boiler was left idle, and the concentration of DEAE and CHA was not diluted before the boiler was used on December 5.

Persons working in the humidified area on December 5 were at increased risk for becoming ill (illness defined as the presence of at least two of the above symptoms), compared with employees in other areas of the plant that were not humidified by steam (relative risk: 4.3; 95% confidence interval - 2.1-9.1). On December 9, after workers had left for the day, steam was released into the work area, and samples of air and boiler water were collected for analysis. DEAE and CHA were not detected in either air or water.

Editorial Note: When present in boiler water, DEAE and CHA can become airborne in boiler steam, which can result in inhalational and/or dermal uptake by exposed persons. Higher acute exposures through this mechanism are more likely if these chemicals are added to a steam-generating system in a single large quantity rather than continuously in small amounts.

Most boilers require daily addition of fresh water to compensate for losses from escaping steam and drained condensate. Although the amount of water added to this boiler between the outbreak and the time when samples were obtained is not know, dilution of the treated boiler water during the intervening 4 days may account for the failure to detect DEAE or CHA.

DEAE and CHA are both strong mucosal irritants. In one report, a laboratory worker who was inadvertently exposed for <30 seconds to DEAE at an estimated concentration 100 ppm (480 mg/m^3) developed nausea and vomiting within 5 minutes. No data are available on human health risks associated with long-term, low-level airborne exposure to these amines.* The Occupational Safety and Health Administration (OSHA) permissible exposure limits (PELs) for DEAE and CHA are, respectively, 50 mg/m^3 (10 ppm) and 40 mg/m^3 (10 ppm) and are established at levels intended to prevent mucosal irritation symptoms. NIOSH has no recommended exposure limit for either substance.

NIOSH has previously investigated three clusters of illnesses related to exposure to boiler steam that contained DEAE or related corrosion-inhibiting chemicals. In 1981, 24 employees in the office area of a production building developed skin rashes; many of the employees also reported dry throats, headaches, and chest tightness. Investigators concluded that the dermatitis resulted from exposure to a condensation or reaction product of DEAE that had been added to the air-handling system. In 1982, employees in a museum where DEAE had been added to a humidification system reported eye irritation and dermatitis. Air sampling detected DEAE concentrations of only 0.05 mg/m^3 and 0.04 mg/m^3, and direct contact with released DEAE that had subsequently condensed on surfaces was proposed as an exposure pathway. In 1988, hospital staff nurses reported symptoms of eye and upper respiratory tract irritation after the introduction of CHA and morpholine (a similar nitrogen-containing corrosion inhibitor) into boiler water used to humidify a nursery and neonatal intensive care unit (NIOSH, unpublished data).

The OSHA PELs for DEAE and CHA were promulgated for the protection of industrial workers and are not intended to protect members of the general public, which may include children, the elderly, those in ill health, and others who may be particularly sensitive to the effects of these substances. As a result of the investigation in this report, NIOSH recommended that the electronics manufacturer discontinue use of amine-based corrosion-inhibiting chemicals in boiler steam that is intentionally released to humidify occupied buildings. At least one major supplier of corrosion-inhibiting chemicals has recognized this potential health hazard asssociated with DEAE and, in 1983, advised its customers against such use (Union Carbide Corporation, unpublished data, 1985).

MMWR 11/30/90

*Under certain conditions, it is theoretically possible that DEAE (or related compounds) in boiler water may be converted to nitrosamines, which are suspected human carcinogens. No experimental evidence exists to indicate whether this occurs, particularly in boiler systems of the type discussed here.

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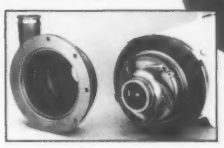

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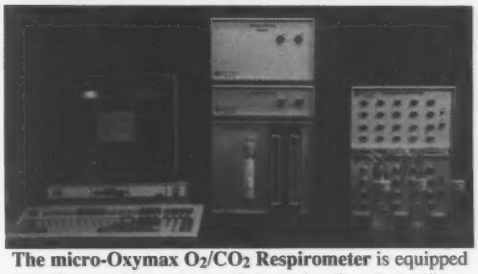

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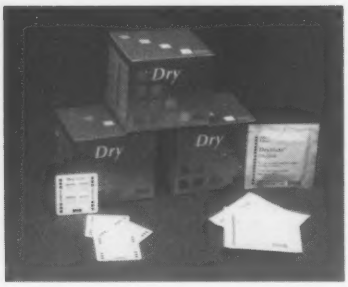
PH: (614) 488-6176 Toll Free: 1-800-669-5011
Fax: (614) 276-0529 TLX: 246514

Stop by our Exhibit at the 1991 IAMFES Annual Meeting

Industry Products



Oxidase Testing New Safe and Convenient Format

DrySlide™ Oxidase is a new, innovative, disposable slide which contains mounted film coated with oxidase reagent (N,N,N',N'-tetramethyl-p-phenylenediamine dihydrochloride) to aid in the identification of bacteria. Since DrySlide Oxidase is a self-contained device, there are no potentially hazardous glass slides, thin paper strips, reagent bottles, crush ampules or Petri dishes to handle and discard. The result is a new measure of safety while performing one of the most common biochemical tests in a microbiology laboratory.

DrySlide Oxidase is supplied ready to use. The need for rehydration or reagent preparation has been eliminated. Simply remove DrySlide Oxidase from its pouch and rub organism onto the film. The appearance of a dark purple color within 20 seconds indicates a positive result. The compact design and room temperature storage add to DrySlide's convenience.

The large reaction area allows for multiple testing on a single slide. DrySlide Oxidase is packaged with 75 slides per box.

DIFCO Laboratories - Detroit, MI

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Nylon Sanitation Coating/ Shelving Exchange Program

Shelf-Kote Enterprises specializes in the Nylon Sanitation Coating of shelving, equipment and all metal parts, providing up to 50% savings over similar replacement.

Shelf-Kote applies a USDA-approved nylon coating, providing one of the most durable finishes available against rust and corrosion in the industry today.

Additionally, our Shelf-Kote finish effectively retards bacterial growth and allows for fast, easy clean-up.

Our "Priority Production" program provides for obsolete, custom or modified items/ shelving, to be nylon coated and returned within three (3) days.

Standard sizes of walk-in cooler shelving, as well as over 100 sizes of reach-in refrigerator shelving are available from Shelf-Kote's inventory for immediate exchange. All shelves are covered with approximately 15 mils of USDA-approved nylon and are "Guaranteed Against Rust Formation for Ten Years!"

Shelf-Kote Enterprises - Barrington, IL

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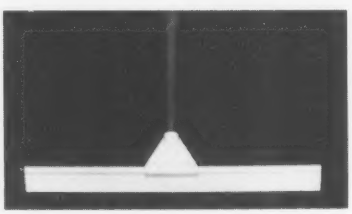

Hygienic Floor Squeegee

The Supply Corporation is pleased to offer the Hygienic Floor Squeegee. The 100% polymer construction is sanitary and simplifies blade changing and eliminates rust and corrosion. The one-piece blade is simply inserted into the handle connector until it is locked in place. The blade can also be easily removed to clean, replace, or reverse it. A durable PVC handle with its patented connector will accommodate 18", 24", or 30" blades and will not splinter like wood or fiberglass, nor will it conduct electricity. This squeegee is impervious to water, petroleum products, acids, chemicals, and grease and can be easily sanitized. The PVC polymer blade is 2" high and the connector provides a precise push/ pull angle for efficient forward or reverse action.

The Supply Corporation - Lake Geneva, WI

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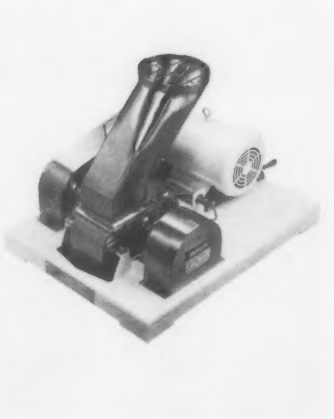

Fitzpatrick Size-Reduction Machine Earns USDA 3A Approval for Dairy Use

A comminutor from The Fitzpatrick Company has been granted USDA 3A approval for processing all types of dairy products. The approved size-reduction machine, Model DAAS06, meets rigorous standards designed by the USDA Dairy Standardization Division.

The machine design guards against contamination that can result from product buildup inside the processing chamber. Fitzpatrick minimized residue accumulation with a special rotor construction, USDA-approved smooth surface finish, and stainless steel construction of all product-contact parts. The machine disassembles for easy cleaning.

Existing DAS06 Comminutors can be factory retrofitted to comply with USDA-Dairy-3A specifications. Fitzpatrick's size-reduction machines have been USDA-certified for meat and poultry applications since 1970.

The Fitzpatrick Company designs and manufactures compaction/densification, size-reduction, pre-breaking, fluid-bed drying, and blending equipment, and integrates them as needed to meet the specialized processing needs of the pharmaceutical, cosmetic, food processing, chemical and plastics industries.

The Fitzpatrick Company - Elmhurst, IL

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on your Reader Service Card

Micro Motion® Releases the DL65 Mass Flow and Density Sensor

The DL65 mass flow and density sensor solves flow measurement problems associated with highly viscous fluids and sanitary applications. Designed with one continuous flow path, this sensor easily accommodates applications requiring "clean-in-place" and sterilization. The DL65 has been approved by the USDA for meat and poultry, and complies with 3-A Sanitary Standard #28-01, Flowmeter for Milk and Milk Products. Typical applications include the metering of difficult process fluids such as egg slurries and molasses.

The DL65 delivers high precision flow measurement accurate within ± 0.2% of flow rate, regardless of changes in fluid temperature, density, viscosity, conductivity or flow profile. 316L stainless steel tubing with a 5/8" diameter yields a flow range of 0-250 lb/min.

The DL65 flow sensor is the third and smallest sensor in Micro Motion's DL series. The larger DL100 and DL200, sensors with 1- and 2-inch tubing, accommodate greater flow rates. All three DL sensors interface with Micro Motion transmitters and peripheral products.

Micro Motion, Inc. - Boulder, CO

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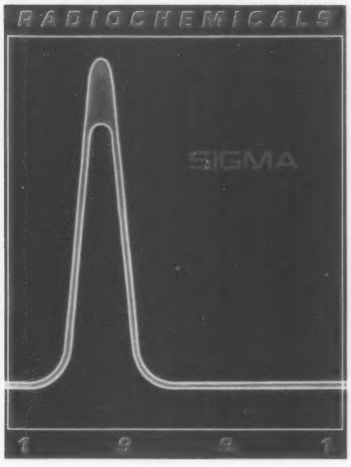

1991 Sigma Radiochemicals Catalog

Sigma Chemical Company announces the availability of its 1991 Radiochemical Catalog. This catalog lists over 350 radiolabeled products and reagents including a new line of Cell Culture Tested radiochemicals in a convenient new multi-dose vial. Look for our new LSC cocktails, Sigma-Fluor™ and radioactivity decontaminant, Sigmaclean™.

Sigma Radiochemicals - St. Louis, MO

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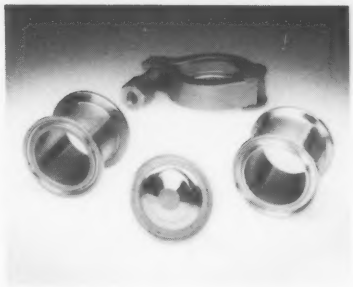

FRB-S Sanitary Rupture Disk Device

A new rupture disk, the FRB-S, has been developed by BS&B Safety Systems. The FRB-S is the first rupture disk device designed specifically for pharmaceutical, biotech and other sanitary market applications. The extremely low burst pressures that may be reached with this disk, combined with its widely acceptable "Tri-clover Type" design make it the perfect disk for over-pressure relief in reactors, vessels, and most other sanitary pressure systems.

Size: 1 inch relieving capacity
Material: 316SS, special material available upon request
Gaskets: Viton or medical grade Silicon
Burst Pressures and
Tolerances: 12 to 40 PSIG ± 2 PSIG
40 to 100 PSIG ± 5%
Safety Head: The outlet FR-C must be supplied by BS&B as this is the control mechanism to prevent upside down installation. The standard "Tri-clover" inlet may be supplied by the customer or by BS&B.

BS&B Safety Systems - Tulsa, OK

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New Food Science Brochure

A new brochure describing titles in the field of food technology is now available from Butterworth-Heinemann professional publishers.

The brochure features nine titles, including *Food Safety 1990: An Annotated Bibliography of the Literature* (publishing in June, 1991). An annual publication compiled by the Food Research Institute at the University of Wisconsin-Madison, this book contains the most timely information on over 90 topics compiled from nearly 2,000 publications.

Also featured is *Principles and Practices for the Safe Processing of Foods* (publishing in May, 1991), edited by D.A. Shapton and N.F. Shapton, consultants for H.J. Heinz and Company of Pittsburgh. This book demonstrates the methods and guidelines whereby food processors can safely manufacture wholesome foods under controlled conditions.

Other prominent titles include *Biotechnology and Food Safety* (edited by D.D. Bills and S.D. Kung), a text based on the proceedings of the Second International Symposium on Biotechnology and Food Safety; and *Dictionary of Nutrition and Food Technology, Sixth Edition* (edited by Arnold E. Bender, formerly of Queen Elizabeth College, the University of London).

Butterworth-Heinemann - Stoneham, MA

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New Handi Holder

Evlo Plastics, Inc., announces the HANDI HOLDER for paper milk cartons, juice cartons and 2 liter pop bottles.

The HANDI HOLDER is safe and convenient with an easy grip handle, ideal for small children and the elderly.

The Sure Grip holder prevents messy spills as well as catching drips and condensation.

The HANDI HOLDER comes in both 1/2 gal and 1 qt sizes in a variety of colors. A 4 dozen display half-gallon Handi Holder comes in a combination shipping carton which opens into a compelling floor display. Large quantities may be imprinted with company name and logo.

Evlo Plastics, Inc. - Sandusky, OH

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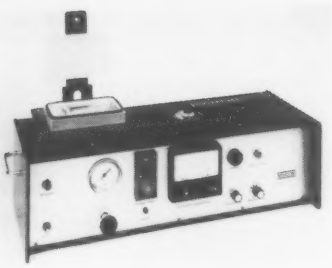

Mocon Announces Non-Destructive Package Leak Detection System

The Pac Guard 400 is a non-destructive leak detection system designed for production line quality control and package development applications. Simple and fast system operation helps assure final product integrity. The Pac Guard 400 can detect weak heat seals, gross leaks, or small pinholes in finished packages. Packages that can be tested include blister packs, foil and plastic pouches, thermoformed cups, bottles, boxes and other small sealed packages.

The Pac Guard 400 works best with dry products where some internal headspace exists. Ideal applications include sterile medical supplies and a variety of products in the food and pharmaceutical industries.

Modern Controls, Inc. - Minneapolis, MN

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New Haake Solvent Trap Accessory Ideal for Test Samples Which Evaporate Easily

Fisons Instruments has introduced a new Haake solvent trap accessory designed to minimize the effects of solvent loss during rheometric testing. The unit is ideally suited for the investigation of gasoline, paints and coatings, inks and a variety of other chemicals which readily evolve vapors.

An optional add-on accessory to the Haake CV20 and CV100 rheometers, the unit enables the user to surround volatile samples with a solvent, thereby saturating the atmosphere. This minimizes solvent loss and allows for longer term rheological measurements to be performed.

According to Randy Byrne, Haake's Director of Marketing, "the Haake solvent trap accessory is easy to operate and does not compromise the integrity of the results. It also provides a cost-effective alternative to expensive, fully enclosed vessels."

Haake is a leading designer and manufacturer of technically advanced torque rheometers, viscometers, thermal liquid temperature control devices, circulators, baths, recirculators and chillers. In January 1989, Haake joined with Carlo Erba Instruments and Applied Research Laboratories (ARL) to form Fisons Instruments, thus consolidating the existing sales, service and technical support for their various product lines.

Fisons Instruments - Valencia, CA

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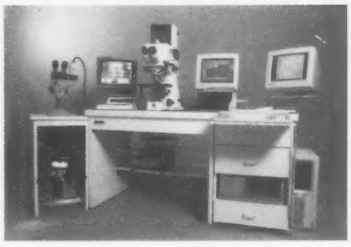

Carl Zeiss Inc. Introduces a Unique, Modular Workstation for Materials Analysis

Carl Zeiss, Inc., has introduced a unique modular system called MARS, (Materials Analysis Research Station), designed for a variety of materials analysis applications including research and development and failure analysis.

The workstation, developed by Carl Zeiss, Inc., is comprised of several different Zeiss materials analysis systems, including: an AXIOPLAN® universal research microscope; a Zeiss stereo microscope; and MHT-4 microhardness tester; and a VIDAS (Video Digital Analysis System). The workstation can be tailored to meet the specific needs of users and is ideal for a variety of applications in materials evaluation, structural analysis, industrial research as well as biomedical investigations.

The cornerstone of MARS is a versatile instrument table, specially designed with a vibration isolation platform for sensitive, accurate measurements and optimal documentation. The table contains an air suspension system with a customized microscope platform and a cabinet with drawers for added storage space. Three monitor stands provide flexible monitor placement for the system operator.

Carl Zeiss, Inc. - Thornwood, NY

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Sparta Brush Start-Up Kits for Food Service

Whether you're beginning a new food service operation, remodeling one or implementing improved sanitation standards, Sparta Brush Company is offering complete brush kits to meet your needs.

Food service professionals helped Sparta select the proper brushes for three specific operations: Fast Food, Restaurant or Institutions. Each of these kits contains brushes for food preparation, clean-up and janitorial use. For example, the Fast Food Kit contains four food preparation brushes, 10 clean-up brushes with two storage racks, and 16 janitorial brushes.

In addition to the brushes, each kit contains the "Wide World of Food Service Brushes" training video developed by Sparta for foodservice and culinary schools, chains, healthcare facilities and state and local health inspectors. A laminated "Kitchen Directory" poster in each kit helps take the guesswork out of proper brush usage.

Sparta Brush Company is one of the leading manufacturers of quality brushes for the food service, processing, dairy, industrial, healthcare and gourmet industries.

Sparta Brush Company - Sparta, WI

Please circle No. 253
on your Reader Service Card

Simple, Fast, Accurate Food Pack Analyzers of O_2 and CO_2 in CAP/MAP Containers

The Servomex 1450 Series offers simple, fast and accurate simultaneous analysis of oxygen and carbon dioxide levels in the headspace of soft and rigid containers.

Specifically designed for controlled and modified atmospheric packaging (CAP/MAP) applications, the Model 1450 measures oxygen with a maintenance-free paramagnetic cell unaffected by carbon dioxide, and measures carbon dioxide with a single beam, dual wavelength infrared bench unaffected by oxygen - both are purely physical methods requiring no consumables or routine maintenance.

Enclosed in a single 19 inch rack mountable or lab top case, the 1450 has a common sampling system giving fast, accurate results from sample volumes as small as 8 ml.

Servomex Company - Norwood, MA

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on your Reader Service Card

Aseptic Bag-In-Box Packaging Provides Maximum Shelf-Life

Packagers of products such as tomato pastes, juices, fruit concentrates, dairy goods, and sauces can extend product shelf-life and reduce costs with aseptic bag-in-box packaging from Sonoco Products Company.

Because of its long-lasting barrier properties, Sonoco's aseptic bag-in-box package can maximize the shelf-life of perishable non-shelf-stable products. For example, tomato paste aseptically packaged in bag-in-box can realize a shelf-life of up to 18 months.

In addition, the bag-in-box package costs less than other containers. It is lightweight, which saves on storage and shipping costs. The virtually unbreakable package is also convenient to fill and handle, and its cubic shape provides efficient stacking.

Unlike other paper/plastic aseptic containers, the bag-in-box separates easily for recycling.

To meet packagers' individual needs, Sonoco offers a variety of bag structures, including coextruded barrier films with up to 14 layers, metallized PET barrier and aluminum foil barrier laminates. Sonoco bags feature rounded corner seals for added strength and leakage prevention.

In the United States, Sonoco exclusively supplies Alfa-Laval's StarAsept™ aseptic bags and filling equipment for low- and high-acid needs, as well as other filling systems.

Sonoco Products Company - Hartsville, SC

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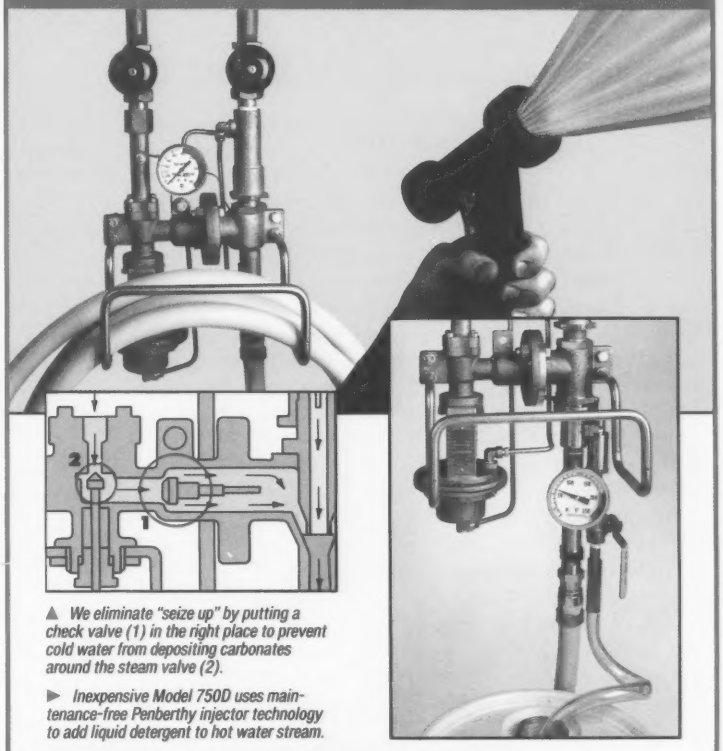
Please circle No. 105 on your Reader Service Card

Three good reasons to specify Penberthy Washdown Stations



▲ *We eliminate "seize up" by putting a check valve (1) in the right place to prevent cold water from depositing carbonates around the steam valve (2).*

► *Inexpensive Model 750D uses maintenance-free Penberthy injector technology to add liquid detergent to hot water stream.*

1 Safe, low-maintenance design.

Penberthy washdown stations mix steam and cold water to provide **hot water on demand**—without the maintenance and safety problems that plague competitive units. Our stations reduce deposit buildup to practically zero. We put a check valve **in the right place** to prevent cold water from depositing carbonates around the steam valve—so it won't seize up!

2 Application versatility.

Besides our standard HSW 750 unit, we offer a Model 750L, designed to operate with steam pressure as low as 10 PSIG, or off waste steam. Also available is the 750H, operating with steam pressures as high as 200 PSIG. And all Penberthy washdown stations are **mount-compatible**. Simply disconnect theirs and install ours—no re-piping necessary.

3 Low-cost detergent model.

Our 750D detergent model makes it a cinch to add liquid detergents to the hot water stream, right out of a standard 55-gallon drum or any other container. Compare this compact, inexpensive, and low-maintenance station to their cumbersome, expensive "portable" unit.

Need any more reasons to specify Penberthy?
Then give us a call.

PENBERTHY, INC.
P.O. Box 112, Prophetstown, IL USA
TEL: (815) 537-2311 FAX (815) 537-5764
TELEX: 257-339 PMCO PRWN

Affiliate News

AAMFES Annual General Meeting
February 27, 1991
Faculty Club, University of Alberta

President's Report

1990 was a year of tremendous social and economic change in Alberta, as well as the rest of Canada. Changing economic conditions in Alberta saw consolidation in a number of industries, including the food industry. As well, economic shortfalls found all levels of government and educational institutions struggling to cope with budget cutbacks and staff reductions. If the recession deepens, as is predicted, this situation will continue to plague all associations, including AAMFES. The challenges faced during 1990 will likely continue for the new executive. This will require the coordinated support of the entire membership to mediate the impacts on our association.

Despite challenges of 1990, I feel that AAMFES enjoyed a relatively successful year. There were seven executive meetings; two general meetings; continuation of the affiliate newsletter; formation of a policy committee; and one of our members, Dr. Michael Stiles, was the recipient of the prestigious IAMFES Educator Award. Dr. Stiles is the first Canadian to receive this award which reflects his outstanding service and contribution to food safety and sanitation in both academia and industry. I know that all our membership join in my congratulations to Dr. Stiles for his outstanding achievement!

AAMFES had a very successful meeting in January, 1990 on "Probiotics" given by Dr. Robert Sellers, from the Chr. Hansen Company (Milwaukee, WI). Similarly, today we are fortunate to have Dr. John Waters, Director Communicable Disease Control and Epidemiology, Alberta Health, speaking to us on a topic of great concern to the food industry. The AAMFES membership has been very supportive of our meeting activities, as they always are. The membership also makes many efforts to invite "friends" from industry, academia and government, some of whom go on to become AAMFES members. In the past year we have had 5 new members join AAMFES. These efforts are encouraged to continue.

In February 1990 an invitation was issued to AAMFES members to establish a policy committee. In an age where electronic media can instantaneously communicate sensationalist events and perceptions, our governments and businesses come under ever increasing pressure to deal with this media-induced hysteria. An example of this was the banning of ALL Chilean produce in late 1989 because two single grapes contained traces of cyanide. AAMFES membership is unique in that, all of our members are highly qualified and trained public and environmental health professionals. This uniquely positions AAMFES to be able to realistically and properly assess real and perceived risks and to communicate this to our business and political leaders. In May, 1990 AAMFES received an invitation from the Hon. Nancy Betkowski, Minister of Health, to comment on the principles, directions and recommendations of the **Rainbow Report** (Premier's Commission on Future Health Care for Albertans), which we did. Similarly in the fall of 1990, AAMFES was provided with the opportunity to comment on the new, draft Environment Legislation, which we also did.

Upcoming IAMFES Affiliate Meetings

1991

MAY

•**13-14, New York State Association of Milk and Food Sanitarians Super Conference** will be held at the Sheraton Inn, Liverpool, NY. For more information contact Paul Dersam at (716)937-3432.
•**13-15, Pennsylvania Association of Dairy Sanitarians and Dairy Laboratory Analysts Annual Conference** will be held at the Keller Conference Center, Penn State University, University Park, PA. For more information, contact Sid Barnard, 8 Borland Lab, University Park, PA 16802, (814)863-3915.

JUNE

•**5, Tennessee Association of Milk, Water and Food Protection Annual Meeting** will be held at the Ramada Airport, Nashville, TN. For more information contact Dennis Lampley at (615)360-0157.
•**11-12, Texas Association of Milk, Food and Environmental Sanitarians Annual Meeting** will be held at the Howard Johnson, South, Austin, TX. For further information contact Janie Park at (512)458-7281.

SEPTEMBER

•**24-26, New York State Association of Milk and Food Sanitarians Annual Conference** will be held at the Sheraton Inn, Liverpool, NY. For more information contact Paul Dersam at (716)937-3432.
•**25-26, Wisconsin Association of Milk and Food Sanitarians - WEHA Joint Education Conference** will be held at the Maritime Inn, Manitowoc, WI.

AAMFES officers (l to r): *Mike Mavromaras, Treasurer; Karen Emde, Immediate Past President; Tom Lampman, President; Harry Jackson, President-Elect; James Steele, Past President and IAMFES Delegate; Ken Yu, Director.*

Hopefully, the membership and the new executive will see fit to continue this type of activity.

In closing, I wish to thank the executive for their support, dedication and enthusiasm this past year. I also wish to thank the membership for their support of AAMFES activities and hope that they will continue to do so. There are many challenges to be faced in the coming year that will require the coordinated effort of all our members together with the new executive.

I have appreciated the opportunity to serve as your president.

Respectfully submitted,
Karen Emde,
President, AAMFES

Shireene Sementi, President
Idaho Environmental Health Association

Idaho Environmental Health Association President's Message

During our last business meeting, we discussed the recent exodus of experienced District environmental health staff to DEQ, INEL, Hanford etc. There appear to be several reasons for this including a) low District salaries, b) limited opportunities for professional development within the Districts c) dissatisfaction with Health District management and d) the perception that Health District workloads are unreasonable. The September 1987 Journal of Environmental Health contained the results of a job satisfaction survey conducted for environmental health professionals employed by county health departments in Illinois. The survey found that one in seven individuals was very dissatisfied with her/his job due to a) low wages b) lack of opportunity for advancement, c) insufficient challenge and d) unmanageable work loads. It appears that at least some of the Districts' problems are not unique.

As a professional organization, what can we do to improve this situation? We can educate the public, our elected officials, and Health District administrators regarding the public health benefits of retaining experienced staff. Implementation of needed changes will, however, fall to the Health District administrators. What can they do? There appear to be a number of options which might reduce the high turnover:

a) Increase salaries by promoting all experienced staff to the Senior EHS position. Anyone who coordinates a program is eligible and the Districts have more than enough programs to go around.
b) Strive for a comfortable workload. If staff cannot be increased, then decrease the numbers of inspections and services provided and let the public know you need more staff. If a decision is made to reduce services, be prepared to handle the public when they complain. Let them know where to direct their complaints and don't change the decision. When staff do resign, replace them or reduce the workload accordingly. It is unreasonable to expect existing staff to do double duty to save the District a few bucks.
c) Allow staff the freedom to do their jobs their way. They are all college graduates who are capable of writing their own letters, managing their time, prioritizing their workload, and making their own decisions. Being in control may provide consistency, but it stifles individual creativity, limits their job satisfaction, and encourages mediocrity.
d) Develop new Health District programs which will challenge experienced staff. Our communities all have problems which can be successfully managed through the Health Districts. These programs can benefit both the community and Health District staff.
e) Above all, remember that the staff are the Health Districts' most valuable asset. The public's view of the Districts is based on their experiences with their staff. If the public views the staff as inexperienced, unaccommodating, and diagreeable, this will be their view of the Districts. If Health Districts are to retain the high regard of their communities, it is imperative that they retain experienced staff who are satisfied with their jobs and are eager to serve their publics.

Respectfully submitted,
Shireene Sementi, President

Kirby Named WAMFS Sanitarian of the Year

Ken Kirby was named WAMFS Sanitarian of the Year at the Joint Education Conference Awards Banquet held on Sept. 19, 1990 at Oshkosh.

Ken, a Dairy Farm Specialist with A & L Laboratories, Minneapolis, MN, is well known as an educator in the areas of milking management, mastitis control, stray voltage sanitation and general milk quality. He has traveled widely throughout North America as an educator and troubleshooter in these areas.

He is a charter member of the National Mastitis Council, which was formed in 1960, and has served as membership co-chairman. He has been a member of IAMFES since 1963 and a member of WAMFS since 1974. As WAMFS President in 1989, Ken was instrumental in revamping the Association's committee structure and in establishing the current association newsletter. In 1990, he was involved in forming the coalition between WAMFS and the Associated Illinois Milk, Food and Environmental Sanitarians to host the 77th IAMFES Annual Meeting at Arlington Heights, IL. In 1988, Ken received the Harold Barnum Award, which is the highest award that IAMFES presents to an industry representative.

Ken and Marion, his wife of over 40 years, reside at Oak Knoll Farm, near Busseyville (Jefferson Co.).

Congratulations, Ken!

IAMFES New Members

Arizona

R. Dale Morton
Dial Corporation
Scottsdale

Arkansas

Barron Gray
Yarnell Ice Cream Company
Searcy

California

Maryam Keshmiri
University of Northridge
Moorpark

Jianghong Meng
University of California - Davis
Davis

Georgia

Norman J. Stern
USDA-ARS
Athens

Idaho

Valerie Z. Roach
Nonpareil Corp.
Pocatello

Iowa

Carol A. Ziel
Hach Company
Ames

Kansas

Laurence Franken
C.P.I. Corporation
Wichita

Kooranee Tuitemwong
Manhattan

Kentucky

Porter W. Baily
Rockfield

Patrick J. Klein
Dean Foods
Louisville

C. Rick Molohon
Lincoln Trail District Health Dept.
Elizabethtown

Louisiana

Patti L. Wiese-Lehigh
Louisiana State University
Baton Rouge

Missouri

David Fox
ConAgra
Columbia

New Jersey

Kathleen Jost
Silliker Laboratories
Garwood

New York

Brian F. Wagner
Multiform Desiccants, Inc.
Buffalo

Ohio

Margaret Gerwin
Stouffer Foods Corp.
Solon

Oregon

Gretchen N. Dysart
Oregon Department of Agriculture
Lake Oswego

Pennsylvania

Robert E. Turner
Westfalia Systemat Co.
Gettysburg

Texas

Glenn Dennis
Food & Drug Administration
Dallas

Howard Depoy
Borden, Inc.
Conroe

Ronnie Liedtke
Dannon Co., Inc.
Ft. Worth

Gina R. Lundell
A.M.S.I.
San Antonio

Virginia

W. David Goolsby
Defense Commissary Agency
Fort Lee

Washington

Norris Anderson
Correctional Industries
Monroe

David J. Borkowski
Darigold, Inc.
Seattle

Mary Zeretzke
San Juan County Health Dept.
Friday Harbor

Wisconsin

Mike Sipple
Galloway-West
Fond du Lac

Canada

Donna Hammill
Caterair International
Toronto

James Muir
Agriculture Canada
Edmonton

W. Pollock
Etobicoke Health Department
Etobicoke

Bonnie Nicholson
Microbiologist
Vancouver

Santi Vicente
Monarch Fine Foods
Rexdale

Michael Von Kaitz
Nestle Food Service
Brampton

Finland

Tiina Mattila-Sandholm
Technical Research Centre of Finland
Espoo

Stop by our Exhibit at the 1991 IAMFES Annual Meeting
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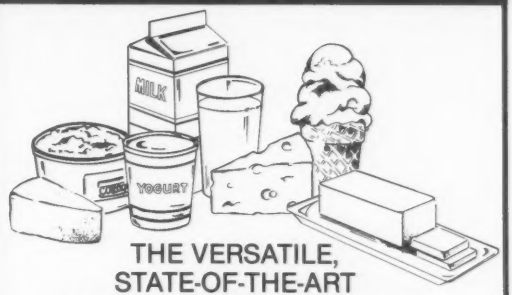
DAIRYLAB



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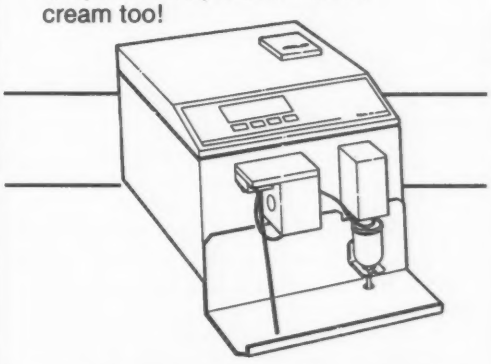

- Can handle most viscous products such as cream without dilution
- Minimal sample preparation
- Choice of wavelength selection, including patented "B" wavelength for fat measurement
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- Auto zero, auto calibration, applications software packages available

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Synopsis of Papers for the 78th Annual Meeting

Abstracts of papers to be presented at the 78th Annual Meeting of the International Association of Milk, Food and Environmental Sanitarians, Inc. to be held in Louisville, Kentucky, July 21-24, 1991.

Water Quality of Wells on Poultry Farms in Tennessee, F.A. Draughon*, H.C. Goan, T.N. Burcham, H.P. Denton, and J.R. Jared, University of Tennessee, P.O. Box 1071, Knoxville, TN 37901-1071

This study was undertaken to learn more about the current water quality of wells on poultry farms in Tennessee. A survey form for each location was prepared to evaluate number of broiler houses, condition of wells, etc. Water samples were taken for determination of coliform, fecal coliform, fecal strep, total aerobic bacteria, *Salmonella* and nitrate from 113 locations across Eastern Tennessee. Fecal coliforms exceeded 100 per 100 ml water at 9 locations. Total coliforms exceeded 100 per 100 ml water at 14 locations. *Salmonella* was detected in three wells. Presence and level of fecal coliform or fecal strep did not correlate well with presence of *Salmonella*. Aerobic bacterial counts ranged from 0 to log 4.5/ml. After "shock chlorination" of one of the most heavily contaminated wells, no fecal coliforms were detected.

Improving Food Safety Education in Public and Private Schools, Homer C. Emery*, Robin Bachle and Velma King, U.S. Army, P.O. Box 1832, Frederick, MD 21701

Recommendations by the Conference on Food Protection to improve food safety habits of the general population have included the development and implementation of food safety curriculum in public and private schools. The authors conducted a survey of K6 curricula related to food safety in selected school systems. Findings indicate that a majority of textbooks in current use include food safety information but that teaching aids and resources for classroom teachers are limited or not available. The authors outline strategies for local health departments, food industry associations, and professional organizations to improve food safety curriculum in public and private schools.

Effects of Oxygen Absorber and Other Packaging Conditions on the Shelf Life of Dry Whole Milk, J.A.F. Faria* and M.R. Silva, Universidade Estualde Campinas/FEA, C.P. 6121, 13081-Campinas-SP, Brazil

The shelf life of dry whole milk packed in tinplate cans and high gas barrier pouches with air, nitrogen, under vacuum, or air plus oxygen absorber (Ageless) was evaluated at ambient temperature and at 37°C. The samples were analyzed initially and at 2 months intervals over 18 months by measuring headspace volatile, oxygen, carbon dioxide contents using gas chromatography, color formation, vitamins (A and C), peroxide value, physico-chemical properties, and sensory scores. No significant differences were observed among the treatments prior to 3 months of storage and after this time only the sensory results showed statistical difference ($P < 0.05$). The flavor stability was the most affected parameter but it was stable enough even after 8 months for the samples under vacuum, nitrogen or with absorber. It was concluded that the use of oxygen absorber is the most effective technique for extending the shelf life of dry whole milk when over 12 months of storage is required.

Determination of Atrazine in Milk by Enzyme Immunoassay, Rodney J. Bushway, Lewis B. Perkins, Heather L. Hurst and Bruce S. Ferguson*, ImmunoSystems, Inc., 4 Washington Avenue, Scarborough, ME 04074

A polyclonal enzyme immunoassay (EIA) method has been developed to determine atrazine in process milk including skim, lowfat, whole, chocolate, evaporated, nonfat dry milk, and "half-and-half." The procedure is sufficiently simple for plant use, rapid (15 min) and sensitive (0.2 ng/ml). A linear response from 0.2 to 6.4 ng atrazine per ml was observed using atrazine-spiked milk standards. Same day and day-to-day (over a 2 month period) reproducibility was excellent with most percent coefficients of variation (%CV) below 12 even at the 0.2 ng/ml level. Cross-reactivity was such that this method could be used to determine other triazine pesticides in milk. Confirmation and triazine identification could then be performed by conventional chromatography (GC or HPLC) methods. Milk products collected around the world have been tested by this immunoassay procedure. The EIA was proven to be a very effective screening method for triazine milk contamination.

The Effects of Storage Time and Temperature on the Growth of *Salmonella Enteritidis* in Naturally Contaminated Eggs, Richard K. Gast* and C. W. Beard, USDA, ARS, Southeast Poultry Res. Lab, 934 College Station Road, Athens, GA 30605

Laying hens were experimentally infected with a phage type 13a strain of *Salmonella enteritidis* (SE). Three trials were conducted, using a total of 68 hens. Eggs laid by these hens were collected daily between the 4th and 14th days postinoculation and randomly allocated into 3 groups. One group of eggs was sampled for SE on the day of collection, one group was held for 7 days at 7.2 C before sampling, and one group was held for 7 days at 25 C before sampling.

Only 3% of the freshly laid eggs and 4% of the eggs held for 7 days at refrigerator temperature were identified as having SE-contaminated contents, whereas SE was isolated from the contents of 16% of eggs held for 7 days at room temperature. Enumeration of SE in contaminated eggs indicated greater numbers of SE in eggs held for 7 days at 25 C than in eggs from the other two groups, although most contaminated eggs in all groups contained relatively small numbers of SE (rarely exceeding 100/ml).

IAMFES

Preliminary Program

78th Annual Meeting of the International Association of Milk, Food and Environmental Sanitarians, Inc.

In Cooperation with the
Kentucky Association of Milk, Food and Environmental Sanitarians, Inc.

The Galt House, Louisville, Kentucky
July 21-24, 1991

REGISTRATION TIMES

Saturday, July 20 ..... 10:00 a.m. - 3:00 p.m.
Sunday, July 21 ..... 9:00 a.m. - 4:00 p.m.
Monday, July 22 ..... 8:00 a.m. - 4:00 p.m.
Tuesday, July 23 ..... 8:00 a.m. - 4:00 p.m.
Wednesday, July 24 ..... 8:00 a.m. - 12:00 p.m.

EXHIBITOR HOURS

Sunday, July 21 ..... 8:15 - 10:15 p.m.
(Following the Opening Session)
Monday, July 22 ..... 9:30 a.m. - 3:30 p.m.
Tuesday, July 23 ..... 9:30 a.m. - 3:30 p.m.
(Lunch will be available in the Exhibit Hall on Monday and Tuesday from 11:30 - 1:00)

PRE-MEETING WORKSHOP* PROCEDURES TO INVESTIGATE FOODBORNE DISEASES WORKSHOP

Instructor: Dr. Frank Bryan

Friday, July 19 ..... 1:00 - 5:00 p.m.
Saturday, July 20 ..... 8:30 a.m. - 5:00 p.m.

Topics to be included:

Overview of Foodborne Investigations
Receiving Complaints
Obtaining Case Histories and Samples
Analyzing the Data
Case Study Homework Assignment
Review of the Case Study
Identification of Mishandled Foods
Model Surveillance Programs

*Separate Workshop Fee Applies

IAMFES BOARD MEETING

Friday, July 19 ..... 8:00 a.m. - 5:00 p.m.
Saturday, July 20 ..... 8:00 a.m. - 12:00 p.m.

COMMITTEE MEETINGS

You need not be a committee member to attend.

SATURDAY, JULY 20

1:00 - 5:00 Affiliate Council

SUNDAY, JULY 21

9:30 - 10:30 Dairy Quality and Safety (Farm Section)
9:30 - 12:00 Name Change
10:00 - 11:00 Audio Visual Library
10:00 - 11:00 Baking Industry Sanitary Standards
10:00 - 11:00 Past Presidents Advisory
10:00 - 5:00 Communicable Diseases Affecting Man
10:30 - 11:30 Dairy Quality and Safety (Plant Section)
11:00 - 12:00 Sanitary Procedures
11:00 - 12:00 Foundation Fund
11:00 - 12:00 Nominating
1:30 - 2:30 Dairy, Food & Environmental Sanitation
1:30 - 3:30 Applied Laboratory Methods
2:30 - 3:30 Water Quality & Waste Disposal
2:30 - 3:30 Journal of Food Protection, Publication
3:30 - 5:00 Food Sanitation

WEDNESDAY, JULY 24

12:00 - 2:00 Program Advisory

SUNDAY EVENING, JULY 21

OPENING SESSION

7:00 **Welcome to the 78th Annual Meeting** - B. SANDERS, President of IAMFES and D. MARCUM, Chairperson of the Local Arrangements Committee

7:15 **Introduction of the Ivan Parkin Lecture** - D. GABIS, President-Elect of IAMFES

7:20 **The Ivan Parkin Lecture -"Protecting Our Food Supply - An Industry, Regulatory, and Academia Joint Effort"** - GARY HANMAN, Chief Executive Officer, Mid-America Dairymen, Inc., Springfield, MO

The Ivan Parkin Lecture is sponsored by the IAMFES Foundation Fund and is supported by the Sustaining Members.

8:15 Cheese and Wine Reception - Held in the Exhibit Hall. An opportunity to greet old friends, make new ones and view the excellent technical displays.

MONDAY MORNING, JULY 22

DAIRY FARM SYMPOSIUM
Convener: D. MARCUM

8:30 **History of the Milk Control Branch in the State of Kentucky** - D. CONNERS, Commonwealth of Kentucky, Frankfort, KY

8:45 **Kentucky Milk Control Program** - D. KLEE, Commonwealth of Kentucky, Frankfort, KY

9:15 **Brucellosis Program in Kentucky** - D. NOTTER, Commonwealth of Kentucky, Frankfort, KY

10:00 **Break**

10:20 **Drug Residue Testing Program** - D. MARCUM, Commonwealth of Kentucky, Frankfort, KY

11:10 **Dairy Forecast** - W. CRIST, University of Kentucky, Lexington, KY

TECHNICAL SESSION
CHEMICAL METHODS
OF ANALYSIS
Convener: R. DAGGS

8:30 **Fluorometric Analysis of Acid Phosphatase in Meats for Monitoring Cooking Temperatures** - R. ROCCO, C. Davis and W. Townsend, Advanced Instruments, Inc., Needham Heights, MA

8:45 **Anion Exchange Diode Array HPLC Analysis of Heated Ground Beef** - C. DAVIS and W. Townsend, USDA, ARS, RRC, Athens, GA

9:00 **A Low-Cost Technique for Water Activity Without Specialized Instrumentation** - B. KANE, JR., East Carolina University, Greenville, NC

9:15 **Determination of Ozone-Produced Oxidants and Byproducts in Artificial Seawater** - K. SCHNEIDER and G. Rodrick, University of Florida, Gainesville, FL

9:30 **Detection of Antimicrobial Drugs Through Their Functional Group as Compared to Physio-Chemical or Immunological Methods** - E. ZOMER, S. Charm, R. Salter, T. Lieu, and M. Gandman, Charm Sciences, Inc., Malden, MA

9:45 **Volatile Gas Headspace Profiles of Modified Atmosphere-Packaged Red Snapper (*Campus lutjanus*) by Gas Liquid Chromatography** - C. SCORAH and G. Finne, AMSI, College Station, TX

10:00 **Break**

TECHNICAL SESSION
WATERBORNE MICROORGANISMS
Convener: R. NICKELSON II

10:20 ***Cryptosporidium parvum* - A Newly Recognized Waterborne Pathogen** - R. MCMAHON, Massachusetts Testing Laboratory, Dedham, MA

10:35 **Characterization of Plasmids from *Plesiomonas shigelloides* Isolated from Louisiana Blue Crabs** - J. KIM and D. Marshall, Louisiana State University, Baton Rouge, LA

10:50 **Survival and Culturabilty of *Vibrio vulnificus* and Resuscitation of the Viable But Non-Culturable Form in Artificial Seawater Microcosms** - W. BIRBARI and G. Rodrick, University of Florida, Gainesville, FL

11:05 **Environmental Survey on Bacterial Distribution in Catfish Ponds** - C. LEUNG, Y. Huang, and O. Pancorco, University of Georgia, Athens, GA

11:20 **Water Quality of Wells on Poultry Farms in Tennessee** - F. DRAUGHON, H. Goan, T. Burcham, H. Denton, and J. Jared, University of Tennessee, Knoxville, TN

11:35 **Survival of *Listeria monocytogenes* in Several Water Systems** - M. AMIN and F. Draughon, University of Tennesse, Knoxville, TN

FOOD SERVICE SYMPOSIUM
Conveners: R. GRAVANI and J. GUZEWICH

THE ROLE OF EMPLOYEES IN THE SPREAD OF FOODBORNE DISEASE

8:45 **Epidemiological Overview: Foodborne Diseases and Their Spread by Food Workers** - L. HATHCOCK, Indiana State Board of Health, Indianapolis, IN

9:15 **How Current Regulations Address The Problem** - C. OTTO, Food and Drug Administration, Washington, DC

10:00 **Break**

FOOD SERVICE INDUSTRY VIEWS OF THE PROBLEM AND COPING STRATEGIES

10:20 **Food Service Industry Views** - R. HARRINGTON, National Restaurant Association, Washington, DC

10:50 **Food Service Industry Views** - E. LECLAIR, Taco Bell Corporation, Southfield, MI

11:10 **Retail Food Marketing Views** - J. FARQUAHAR, Food Marketing Institute, Washington, DC

11:40 **Wrap Up - Where Do We Go From Here?** - R. GRAVANI, Cornell University, Ithaca, NY and J. GUZEWICH, New York State, Department of Health, Albany, NY

MONDAY AFTERNOON, JULY 22

DAIRY FARM SYMPOSIUM (continued)
Convener: D. MARCUM

1:30 **Milk Hauler Training** - R. BLEDSOE, Commonwealth of Kentucky, Frankfort, KY

2:25 **Outside Influences in the Dairy Industry** - R. PRYOR, Kentucky Farm Bureau Insurance, Louisville, KY

2:45 **Break**

3:10 **Survey of Kentucky Dairy Plants** - A. DEKLEF, Fromageries Bel, Inc., Leitchfield, KY; J. MURRAY, Winchester Farms, Winchester, KY; K. EVANS, Ryan Milk Company, Murray, KY

TECHNICAL SESSION
FOOD MICROBIOLOGY
Conveners: J. SCOTT and A. LAMMERDING

1:30 **The Effects of Storage Time and Temperature on the Growth of *Salmonella enteritidis* in Naturally Contaminated Eggs** - R. GAST and C. Beard, USDA, ARS, Southeast Poultry Research Laboratory, Athens, GA

1:45 **Growth and Production of Enterotoxins A and D by *Staphylococcus aureus* in Salad Bar Ingredients and Clam Chowder** - G. HASSAN, W. Tsai and L. Bullerman, University of Nebraska, Lincoln, NE

2:00 **Thermal Resistance of *Listeria monocytogenes* in Raw Liquid Egg Yolk** - R. MCKENNA, S. Patel and M. Cirigliano, Thomas J. Lipton Company, North Arlington, NJ

2:15 **The Use of Bacteriocin-Producing *Pediococcus* to Control Post-processing *Listeria monocytogenes* Contamination of Frankfurters** - E. BERRY, R. Mandigo and R. Hutkins, North Carolina State University, Raleigh, NC

2:30 **Antibacterial Effect of Selected Naturally Occurring Chelating Agents on *Listeria monocytogenes*** - M. CIRIGLIANO and P. Rothenberg, Thomas J. Lipton Company, Cresskill, NJ

2:45 **Inhibition of *Listeria monocytogenes* by Fatty Acids** - L. WANG and E. Johnson, Food Research Institute, Madison, WI

3:00 **Break**

3:20 **Factors in the Contamination of Beef Tissue Surfaces by *Salmonella typhimurium* Which May Influence the Antibacterial Action of Acetic Acid** - J. DICKSON, USDA, ARS, Roman L. Hruska U.S. Meat Animal Research Center, Clay Center, NE

3:35 **Effects of Ingredients on the Survival of *Campylobacter jejuni* in Processed Turkey Ham** - C. HWANG, F. Draughon, B. Lee, H. Loveday and M. Riemann, University of Tennessee, Knoxville, TN

3:50 **Influence of Modified Atmosphere Storage on the Competitive Growth of *Listeria* and *Pseudomonas* on Chicken** - D. MARSHALL, L. Andrews, J. Wells, and A. Farr, Louisiana State University, Baton Rouge, LA

4:05 **Methods for Selective Enrichment of *Campylobacter* Species from Poultry for Use in Conjunction with DNA Hybridization** - N. STERN and M. Mozola, Russell Research Center, USDA, ARS, Athens, GA

4:35 **Restriction Enzyme Analysis of Clinical Isolates of *Listeria monocytogenes*** - I. WESLEY, USDA-ARS-National Animal Disease Center, Ames, IA

TECHNICAL SESSION
FOOD SERVICE
Convener: B. ARMSTRONG

1:30 **A Practical View of the *Sous Vide* Issue From a Food Service Perspective** - C. HOLDEN, Shoney's, Inc., Nashville, TN

1:45 **Food Service Sanitation Certification Training - The Whys and Hows** - P. GARDNER, Sanisafe & Associates, Inc., Northbrook, IL

2:00 **A Self Care Action Program (SCAP) Applied to Food Service Establishments** - S. SEN, Hartford Health Department, Hartford, CT

2:15 **Increase Quality of Food Service Inspections** - F. PETERSEN, A. McBride and M. Medvedev, Stamford Health Department, Stamford, CT

2:30 **Improving Food Safety Education in Public and Private Schools** - H. EMERY, R. Bachle and V. King, U.S. Army, Frederick, MD

2:45 **A National Survey of Consumer Home Food Preparation Practices** - D. WILLIAMSON and R. Gravani, Cornell University, Ithaca, NY

3:00 **Break**

3:20 **Who Participates in Voluntary Recycling Programs and Why?** - D. MCSWANE and T. Abel, Indiana University, Indianapolis, IN

TUESDAY MORNING, JULY 23

SHELF-LIFE OF DAIRY FOODS SYMPOSIUM
Convener: J. BISHOP

8:30 **Introduction** - J. BISHOP, VPI & SU, Blacksburg, VA

8:40 **Shelf-Life Testing Methods** - J. BISHOP, VPI & SU, Blacksburg, VA

9:20 **Plant Environment vs. Shelf-Life** - C. WHITE, Mississippi State University, Mississippi State, MS

10:00 **Break**

10:20 **Implementation of Shelf Life/Quality Assessment Programs** - J. BLOOM, E.S.S. Laboratory Services, Culpeper, VA

11:00 **Dairy Industry View of Shelf-Life/Quality Assessment** - G. MUCK, Dean Foods, Rockford, IL

11:40 **Concluding Remarks** - J. BISHOP, VPI & SU, Blacksburg, VA

TECHNICAL SESSION
MICROBIOLOGICAL METHODS
Conveners: B. LANGLOIS and R. LECHOWICH

8:30 **Isolation of *Clostridium perfringens* by Aerobic and Anaerobic Procedures from Ground Beef** - M. ALI and D. Fung, Kansas State University, Manhattan, KS

8:45 **Recovery of Microorganisms from Ground Beef by Homogenizing with Hand Roller or Stomacher®** - M. ALI and D. Fung, Kansas State University, Manhattan, KS

9:00 **A Differential-Selective Medium and Simple Atmosphere for Recovery of *Campylobacter jejuni*** - N. STERN, B. Wojton and K. Kwiatek, USDA-ARS, Russell Research Center, Athens, GA

9:15 **Optimized Enrichment Methods and Selective Media for Recovery of *Campylobacter jejuni* from Broiler Chicken Carcasses** - E. LINE and N. Stern, University of Georgia, Griffin, GA

9:30 **Spoilage Rate Comparisons for Ground Turkey and Ground Beef** - N. STERN, C. Lyon, M. Musgrove, J. Dickens and R. Wilson, USDA-ARS, Russell Research Center, Athens, GA

9:45 **Comparison of Methods for Molecular Epidemiology of *Listeria monocytogenes*** - A. BALOGA and S. Harlander, University of Minnesota, St. Paul, MN

10:00 **Break**

10:20 **Evaluation of Reagents for Use in Rapid Methods of Analytical Food Microbiology** - P. PETERKIN, A. Sharpe and E. Todd, Health Protection Branch, Ottawa, Ontario, Canada

10:35 **Development of an Enzyme-Linked Antibody Procedure for Detection of *Salmonella* Using Hydrophobic Grid Membrane Filters** - E. TODD and J. MacKenzie, Health Protection Branch, Ottawa, Ontario, Canada

10:50 **Monitoring the Hygienic Status of Surfaces** - J. HOLAH, Campden Food and Drink Research Association, Chipping Campden, United Kingdom

11:05 **A Comparison of Calibration Data for Conductance Microbiology Using Spiked Margarine and Dairy Products and Naturally Contaminated Products** - J. WELLINGHOFF, B. Vermilyea, D. Belden and D. Knox, Land O'Lakes Spreads Operations, Kent, OH

11:20 **Growth Characteristics of 228 *Salmonella* Isolates in Tetrathionate Brilliant Green Broth, M Broth, and MN Broth at 35°C and 42°C** - M. CURIALE, D. McIver, T. Sons, L. Fanning, W. Lepper, D. Ford, K. Rowe, D. Evanson and R. Flowers, Silliker Laboratories Group, Inc., Chicago Heights, IL

11:35 **Edualette Test: A Proposed Revision to Serological Polyvalent Flagellar (H) Test for *Salmonella*** - I. RUIZ-GARCIA, Industrias Avicolas De Puerto Rico, Coamo, Puerto Rico

COMPUTERS IN FOOD PROTECTION SYMPOSIUM
Convener: C. OTTO

8:30 **National Parks Protect Visitors with Computers** - A. KINGSBERRY, CDC/NPS, Washington, DC

9:00 **Industry Applications of Computers in Food Protection** - B. ARMSTRONG, General Mills Restaurant Group, Orlando, FL

9:30 **EPI-INFO: The Hi-Tech Tool for Foodborne Illness Investigations** - Speaker to be announced, Centers for Disease Control, Atlanta, GA

10:00 **Break**

10:20 **FDA's New Integrated Electronic Inspection System and Prime Connection** - C. OTTO, USPHS, FDA - Retail Food Protection Branch, Washington, DC

11:00 **Effective Business Graphics for your Presentations** - Speaker to be announced, Software Publishing Corporation/Harvard Graphics, Mountain View, CA

11:35 **Panel Discussion**

Computer programs will be demonstrated

TUESDAY AFTERNOON, JULY 24

GENERAL SESSION

PERSPECTIVES ON AMERICAN AND EUROPEAN FOOD PROTECTION ISSUES
Convener: J. KORNACKI

1:30 **Introduction** - J. KORNACKI, Silliker Laboratories of Pennsylvania, Sinking Spring, PA

1:35 **Microbiological Food Safety - An Overview of European Issues** - M. STRINGER, Campden Food and Drink Research Association, Chipping Camden, United Kingdom

2:15 **The National Academy of Sciences Report on Seafood Safety** - C. HACKNEY, VPI & SU, Blacksburg, VA

2:50 **Issues and Activities Facing the National Conference on Food Protection** - D. RESH, Office of Food Protection and Consumer Health Services, Baltimore, MD

3:20 **The National Conference on Interstate Milk Shipments Response to the Milk Safety Issue** - A. PLACE, NY State Department of Agriculture and Markets, Albany, NY

3:40 **Break**

ANNUAL IAMFES BUSINESS MEETING

3:35 **Welcome and Introduction** - D. GABIS, President-Elect

3:45 **Report from the President** - R. SANDERS

4:00 **Business Meeting** - R. SANDERS, Presiding

- **Moment of Silence in Remembrance of Departed Association Members**
- **Minutes of Previous Business Meeting**

- **Report of Executive Manager**
- **Affiliate Council Report**
- **Name Change Committee Report**
- **Journal Management Committee Report**
- **Old Business**
- **New Business**
- **Presentation of Resolutions** - R. CASE, Past President

WEDNESDAY MORNING, JULY 24

TECHNICAL SESSION
DAIRY MICROBIOLOGY, CHEMISTRY AND SANITATION
Convener: D. HENNING

8:30 **The Dispersal of Microorganisms by Cleaning Systems** - J. HOLAH and J. Holder, Campden Food and Drink Research Association, Chipping Campden, United Kingdom

8:45 **Chlorine Dioxide Foam Sanitation in Fluid Milk and Other Dairy Processing Plants** - D. MCCARTY, Rio Linda Division of Albright & Wilson Americas, Sacramento, CA

9:00 **Determination of Atrazine in Milk by Enzyme Immunoassay** - B. FERGUSON, R. Bushway, L. Perkins and H. Hurst, ImmunoSystems, Inc., Scarborough, ME

9:15 **A Rapid Bioluminescence Assay of Alkaline Phosphatase in Milk and Dairy Products Using the Charm II System** - E. ZOMER, S. Trivedi and S. Charm, Charm Sciences Inc., Malden, MA

9:30 **Extending the Keeping Quality of Fluid Milk** - S. BARNARD, The Pennsylvania State University, University Park, PA

9:45 **Effects of Oxygen Absorber and Other Packaging Conditions on the Shelf Life of Dry Whole Milk** - J. FARIA and M. Silva, Universidade Estadual De Campinas, Capinas, Brazil

10:00 **Break**

10:20 **Determination of the Incidence of Coliforms by Preliminary Incubation - One Way to Predict Milk Quality** - E. WOLFF, R. Ledford, R. Holley, J. Labatt and K. Scofield, Cornell University, Ithaca, NY

10:35 **A Rapid Concentration Procedure for Microorganisms in Raw Milk** - L. MARTIN, E. Pahuski, K. Stebnitz, J. Priest and R. Dimond, Promega Corporation, Madison, WI

10:50 **Prevalence of *Salmonella*, *Campylobacter*, *Yersinia enterocolitica*, and *Listeria monocytogenes* in Farm Bulk Milk Tanks** - F. DRAUGHON, B. Rohrbach and P. Davidson, University of Tennessee, Knoxville, TN

11:35 **Germicidal Activity of a Chlorine Dioxide Containing Teat Dip** - B. LANGLOIS, R. Harmon and K. Akers, University of Kentucky, Lexington, KY

WATER IN FOOD PROCESSING SYMPOSIUM
Conveners: J. RUSHING and R. CARAWAN

8:30 **Water Quality - Problems in Food Processing** - J. RUSHING, North Carolina State University, Raleigh, NC

9:30 **The Cost of Not Doing Business** - P. FISHER, Campbell Taggart, Inc., Dallas, TX

10:00 **Break**

10:20 **Pollution Prevention in Food Processing** - Speaker to be announced

10:50 **Opportunities for Water Reuse in Food Processing Operations** - B. SHELDON, North Carolina State University, Raleigh, NC

11:20 **The Role of Universities in Food Processing Environmental Waste Issues** - R. CARAWAN, North Carolina State University, Raleigh, NC

WEDNESDAY MORNING, JULY 24

POSTER SESSION
Convener: B. LANGLOIS

9:00 - 11:30 Authors Present

Effect of Packaging on Shrimps (*Penaeus* spp.) Quality During Ice Storage - W. HUANG, K. Gates and K. Kuoadio, University of Georgia, Athens, GA

A Hazard Analysis Critical Control Point (HACCP) Program for the Production of Imitation Crab - R. SCHROEDER and J. Matches, University of Washington, Seattle, WA

Background Levels and Radiation Dose Yields of O-Tyrosine in Chicken Meat - N. CHUAQUI-OFFERMANS and T. McDougall, Radiation Applications Research Branch AECL Research, Whiteshell Laboratories, Pinawa, Manitoba, Canada

Hydrogen Peroxide-Induced Free Radical Damage on *E. coli* - H. BASAGA, F. Bozoglu and A. Kassab, Middle East Technical University, Ankara, Turkey

Growth Modeling of Proteolytic Strains of *Clostridium botulinum* - R. WHITING and J. Call, Eastern Regional Research Center, USDA, ARS, Philadelphia, PA

***In vitro* Inhibition of *Salmonella typhimurium* and *Escherichia coli* 0157:H7 by an Anaerobic Gram-Positive Coccus Isolated from the Cecal Contents of Adult Chickens** - A. HINTON, JR., D. Corrier and J. DeLoach, USDA, ARS, FAPRL, College Station, TX

Survival of Food-Associated Pathogens Following Sonication - D. WRIGLEY, Mankato State University, Mankato, MN

Fate of *Salmonella* and *Listeria monocytogenes* in Commercial, Reduced-Calorie Mayonnaise - K. GLASS and M. Doyle, Food Research Institute, Madison, WI

Antimicrobial Activity of Sucrose Laurate, EDTA, and BHA Alone and in Combination - A. SIKES and S. Whitfield, U.S. Army RD&E Center, Natick, MA

Microbiocidal Effectiveness of Glucose Oxidase on Chicken Breast Skin and Muscle - D. JEONG, M. Harrison, J. Frank and L. Wicker, University of Georgia, Athens, GA

Performance of a DNA Hybridization Method with Abbreviated Enrichment in the Detection of *Escherichia coli* in Naturally Contaminated Foods - G. DURBIN, A. Shah and G. Reynolds, GENE-TRAK Systems, Framingham, MA

Use of Agar Dipslides for Hygiene Monitoring in a Bakery - M. MOZOLA, T. Kujala and S. Levo, GENE-TRAK Systems, Framingham, MA

Comparison of Two Enzyme Immunoassays for the Recovery of *Salmonella* from Foods - G. ALLEN, P. Stephenson-Sherrod, and W. Andrews, Food and Drug Administration, Washington, DC

An Evaluation of the Conductimetric Method for Total Microbial Activity, Coliforms, and Yeast/Mold of Spices and Seasonings - D. COUSINS, F. Marlatt and K. Zadnik, Radiometer America Inc., Westlake, OH

Incidence of *Brucella* in and the Fat Content of Milk in Cajeme County - M. DIAZ-CINCO and B. Duarte-Leon, C.I.A.D., A.C., Hermosillo, Sonora, Mexico

Development and Evaluation of a Nitrocellulose Membrane Lift Method to Identify *Salmonella* attached to Chicken Skin - M. SLAVICK and H. Tsai, University of Arkansas, Fayetteville, AR

No Observed Effect Level, Safe Concentrations, Milk Residues and Concerns for Milk Safety - C. Miller, J. HALLBERG and E. Robb, The Upjohn Company, Kalamazoo, MI

VIDEO THEATER
Convener: D. MCSWANE

8:30 - 12:00 and 1:30 - 5:00

A List of the Titles and Their Presentation Times will be Printed in the Annual Meeting Program

WEDNESDAY AFTERNOON, JULY 24

SYMPOSIUM: RAPID METHODS FOR *SALMONELLA*: GLUT OR GLUTTONY
Convener: M. BRODSKY

1:30 **Welcome and Introduction** - M. BRODSKY, Ontario Ministry of Health, Toronto, Ontario, Canada

1:50 **Concepts and Considerations in Design and Development** - R. FLOWERS, Silliker Laboratories Group, Inc., Chicago Heights, IL

2:30 **Evaluation and Validation: The AOAC Collaborative Study Process** - G. ALLEN, Food and Drug Administration, Washington, DC

3:00 **Break**

3:20 **Rapid Methods Applications: Facts and Fallacies** - N. COX, USDA, ARS, Russell Research Center, Athens, GA

4:00 **New Horizons** - Panel Discussion, Questions and Answers

LABORATORY SAFETY SYMPOSIUM
Convener: E. KOENIG

1:30 **Laboratory Safety - A Risk Perspective** - R. NELSON, University of Oklahoma, Oklahoma City, OK

2:50 **Break**

3:10 **Safety As It Applies to the Microbiology Laboratory** - J. SCOTT, National Food Processors Association, Washington, DC

3:30 **Application of the OSHA Chemical Hygiene Plan to the Laboratory** - K. CARR, Ralston Purina, St. Louis, MO

3:50 **Update on the Standard Methods for the Examination of Dairy Products Chapter on Laboratory Quality Assurance and Safety** - L. MATURIN, Center for Food Safety, Food and Drug Administration, Summit-Argo, IL

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THEY'RE OFF - LUNCH AT DERBY CAFE
Monday, July 22, 1991
9:00 a.m. - 1:00 p.m.
Cost: $25 (Includes Lunch)

You'll visit historic West Main Street, home of the nation's second-largest district of preserved cast iron facades; then on to the grandeur of St. James Court and one of the country's finest neighborhoods of Victorian mansions. Next, you'll pass by the University of Louisville, oldest municipal university west of the Alleghenies, and its splendid J. B. Speed Art Museum, Kentucky's largest fine arts collection. The famed twin spires of Churchill Downs will greet your arrival at the fabulous Kentucky Derby Museum where you will experience fascinating hands-on Kentucky Derby exhibits and the spectacular three hundred sixty degree multi-image show depicting the panorama of Derby Day! You'll finish your circuit at the world famous Louisville Stoneware for a tour and opportunity to make that prized bargain purchase in the Seconds Shop. **(Tour limited to 47 people).**

BARDSTOWN & JIM BEAM DISTILLERY - LUNCH AT TALBOTT TAVERN
Tuesday, July 23, 1991
9:00 a.m. - 3:00 p.m.
Cost: $25 (Includes Lunch)

Just up the road from Bardstown, your group will wind its way to Clermont, Kentucky, home of the oldest continuing business in the state, Beam Distillery. Nestled among gently rolling hillsides, Jim Beam's American Outpost offers a film on bourbon making and splendid handmade crafts. Your trip into quaint Bardstown includes a must for travelers worldwide - a tour of Federal Hill, the stately Georgian Colonial mansion built circa 1818 and immortalized by composer Stephen Foster as "My Old Kentucky Home." You'll return to days of the antebellum South as your costumed guide points out the rare furnishings, formal gardens, and introduces you to other attractions in the Nelson County seat, such as Spalding Hall, dating from 1826 and now the home of the Oscar Getz Museum of Whisky History. This unsurpassed collection of the bourbon maker's art from pre-Colonial days to post-Prohibition years even contains an authentic - albeit illicit - whisky still! Lunch is at the historic Talbott Tavern. Time allowing, Bardstown's charming stores extend wonderful shopping opportunities. **(Tour limited to 47 people).**

SHELBYVILLE, LUNCH AT OLD STONE INN
Wednesday, July 24, 1991
9:00 a.m. - 3:00 p.m.
Cost: $25 (Includes Lunch)

A visit to the Farm of the nationally known Saddlebred horse trainer, Don Harris, will allow you a fascinating glimpse into the world of gaited horses! At Don Harris Stables, you'll see a demonstration of the skills and finesse being taught these magnificent animals. Then, it's onto your comfortable coach for a short trip to picturesque Shelbyville, and the many fine shops at Science Hill, built in 1870 as a girls' finishing school. Today, the National Register structure houses the Wakefield-Scearce Galleries, noted for its internationally-recognized collections of antique English furniture, fine silver — including a silver vault — and period accessories. A stroll through Science Hill and down Shelbyville's quaint streets is like a trip back in time, perhaps putting you in the mood for a leisurely lunch at the Old Stone Inn. **(Tour limited to 47 people).**

Special Events

Sunday, July 21

8:15-10:00 Early Bird Reception - Cheese & Wine

Monday Evening, July 22

7:00 Belle of Louisville Dinner Cruise

Wednesday Evening, July 24

6:00-7:00 Reception
7:00 Annual Awards Banquet

Events by Invitation

Monday Morning, July 22

7:00 IAMFES Committee Chairperson Breakfast Meeting

Tuesday Evening, July 23

5:30-6:30 Presidential Reception
7:00 Past Presidents' Dinner

78th IAMFES Annual Meeting Registration Form

Galt House - Louisville, Kentucky - July 21-24, 1991
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		Amount	# of tickets	Total Amount
Registration	IAMFES Member (Banquet included)	$ 95 ($125 on-site)		
	Non-Member (Banquet included)	$135 ($165 on-site)		
	IAMFES Student Member	$ 20 ($ 50 on-site)		
	IAMFES Member One Day (Circle: Mon/Tues/Wed)	$ 45 ($ 55 on-site)		
	Non-Member One Day (Circle: Mon/Tues/Wed)	$ 65 ($ 75 on-site)		
	Spouse/Companion (Name): _____	$ 15 ($ 20 on-site)		
	Children (14 & Over), Name: _____	$ 15 ($ 20 on-site)		
	One-Day Exhibits Only (Circle One: Mon/Tues)	$ 10		
***New Membership Fees:**	Membership (*Dairy, Food & Environmental Sanitation*)	$ 40		
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	Student Membership *Plus* (*Dairy, Food & Environmental Sanitation & Journal of Food Protection*)	$ 35		
	POSTAGE CHARGES: OUTSIDE THE U.S. - SURFACE RATE	$ 15 per journal		
	AIRMAIL	$ 95 per journal		
Other Fees: (Per Person)	Cheese & Wine Reception (Sun., 7/21)	FREE		
	Belle of Louisville Dinner Cruise (Mon., 7/22)	Adult $30 ($35 on-site)		
		Children Under 14 -- $ 15 ($ 18 on-site)		
	IAMFES Awards Banquet (Wed., 7/24)	$ 25 ($ 30 on-site)		
Spouse/Companion Events:	They're Off - Lunch at Derby Cafe (Mon., 7/22)	$ 25 ($ 30 on-site)		
	Bardstown & Jim Beam Distillery, Lunch at Talbott Tavern (Tues., 7/23)	$ 25 ($ 30 on-site)		
	Shelbyville, Lunch at Old Stone Inn (Wed., 7/24)	$ 25 ($ 30 on-site)		

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Refund/Cancellation Policy

The IAMFES policy on meeting cancellation/refunds is as follows: "Registration fees, minus a $15.00 processing fee, will be refunded for written cancellations post-marked at least two (2) weeks prior to the start of the meeting. No refunds will be made for cancellations made less than two (2) weeks prior to the start of the meeting, however, the registration may be transferred with written notification to a colleague.

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An exhibition of products and consultant services will be at the Galt House. For more information on exhibiting at the conference, please contact Scott Wells at 1-800-369-6337, 1-800-284-6336 (Canada).

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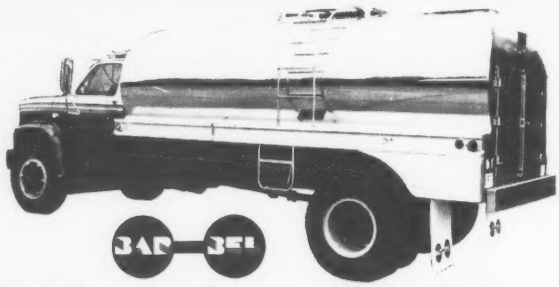

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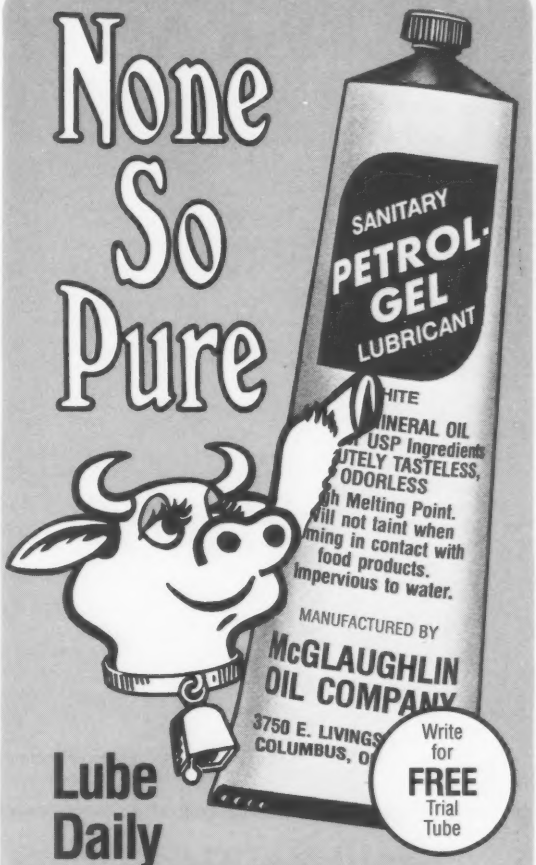

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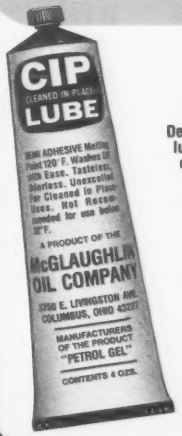

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Coming Events

1991

May

•**4-9, 1991 Food Structure Meeting** will be held at the Hyatt Regency Hotel in Bethesda, MD. For more information contact Dr. Om Johari, Scanning Microscopy International, P.O. Box 66507, Chicago, IL 60666-0507, or call (708)529-6677.

•**6-7, Air Toxics Regulation Conference**, sponsored by Executive Enterprises, Inc., will be held at Seattle Airport Hilton, Seattle, WA. For more information contact Executive Enterprises at (800)831-8333.

•**6-8, SouthPack '91 - Southern Packaging Exposition** to be held at the Georgia World Congress Center, Atlanta, GA. For more information call (203)964-8287.

•**7-8, Canadian Environmental Regulation Course**, sponsored by Executive Enterprises, Inc., will be held at The Palliser, Calgary, AB. For more information contact Executive Enterprises, Inc. at (800)831-8333.

•**7-8, Clean Air Act From A To Z**, sponsored by Executive Enterprises, Inc., will be held at The Westin Oaks, Houston, TX. For more information contact Executive Enterprises at (800)831-8333.

•**9-10, Maximizing Product Safety Workshop** will be held at the Diagnal Data Corporation, Lakeland, FL. For more information contact the International Dairy Foods Association, 888 Sixteenth Street, NW, Washington, DC 20006; (202)296-4250.

•**13-14, New York State Association of Milk and Food Sanitarians Super Conference** will be held at the Sheraton Inn, Liverpool, NY. For more information contact Paul Dersam at (716)937-3432.

•**13-15, Sanitation and Safety for the 90's**, sponsored by The American Sanitation Institute, for food processors and warehousers, will be held at the Hampton Inn-St. Louis Union Station. For more information and/or registration materials, contact Louann Morrow toll-free at (800)325-3371 or, in Missouri, (314)725-2555, or write The American Sanitation Institute, P.O. Box 24198, St. Louis, MO 63130.

•**13-15, Pennsylvania Association of Dairy Sanitarians and Dairy Laboratory Analysts Annual Conference** at the Keller Conference Center, Penn State University, University Park, PA. For more information, contact Sid Barnard, 8 Borland Lab, University Park, PA 16802, (814)863-3915.

•**13-16, Better Process Control School**. For more information contact D.L. Downing, Ph.D., Cornell University-NYSAES, Department of Food Science and Technology, Geneva, NY 14456, (315)787-2273.

•**13-16, Purdue Aseptic Processing and Packaging Workshop**, sponsored by the Food Science Department at Purdue University. For more information contact James V. Chambers, Purdue University, (317)494-8279.

•**13-17, Better Process Control School**. For more information contact Aurora S. Hodgson, Ph.D., University of Hawaii at Manoa, Department of Food Science & Human Nutrition, 1920 Edmondson Road, Honolulu, HI 96822, (808)948-6564.

•**13-17, 3-A Sanitary Standards Committees meeting** will be held at the Grand Hotel, Milwaukee, WI. For further information, contact Dr. Tom Gilmore, Secretary, 3-A Sanitary Standards Committees, at (301)984-1444.

•**16-17, Groundwater Contamination**, sponsored by Executive Enterprises, Inc., will be held at the Washington Hilton & Towers, Washington, DC. For more information contact Executive Enterprises, Inc. at (800)831-8333.

•**18-22, 72nd Annual National Restaurant Association Hotel-Motel Show** will be held at the McCormick Place, Chicago, IL. For more information contact the NRA, 150 N. Michigan Avenue, Suite 2000, Chicago, IL 60601; (312)853-2525, FAX (312)853-2548.

•**20-21, The Hazardous Waste Regulation Course**, sponsored by Executive Enterprises, Inc., will be held at the Washington Hilton & Towers, Washington, DC. For more information contact Executive Enterprises, Inc. at (800)831-8333.

•**21, Dairy Cost Accounting Workshop** will be held at the Chicago O'Hare Marriott, Chicago, IL. For more information contact the International Dairy Foods Association, 888 Sixteenth Street, NW, Washington, DC 20006; (202)296-4250.

•**22, U.W. Dairy Manufacturer's Conference** to be held at the Mead Inn, Wisconsin Rapids, WI. For more information, contact Bill Wendorff, Dept. of Food Science, 1605 Linden Drive, Madison, WI 53706, (608)263-2015.

June

•**5, Tennessee Association of Milk, Water and Food Protection Annual Meeting**, will be held at the Ramada Airport, Nashville, TN. For more information contact Dennis Lampley at (615)360-0157.

•**11-12, Texas Association of Milk, Food and Environmental Sanitarians** will hold their Annual Meeting at the Howard Johnson, South, Austin, TX. For more information contact Janie Park at (512)458-7281.

•**13-14, Listeria and Food Safety,** sponsored by The Aseptic Processing Association, will be held in Laval, France. For more information contact the Conference Secretariat, ASEPT, B.P. 49, 53020 Laval Cedex, France.

•**17-20, Better Process Control School**. For more information contact Robert M. Grodner, Ph.D., Louisiana State University, Food Science Building, Baton Rouge, LA 70803-4280, (504)388-5206.

•**17-20, Basic Microbiology and Mold Monitoring Seminar** sponsored by the American Institute of Baking to be held at AIB, 1213 Bakers Way, Manhattan, KS 66502. For more information call (913)537-4750 or (800)633-5137.

•**24-25, The Hazardous Waste Regulation Course**, sponsored by Executive Enterprises, Inc., will be held at the O'Hare Marriott, Chicago, IL. For more information contact Executive Enterprises at (800)831-8333.

•**27-28, Chemical Labeling Conference**, sponsored by Executive Enterprises, Inc., will be held at the Sheraton Plaza Chicago, Chicago, IL. For more information contact Executive Enterprises at (800)831-8333.

July

•**11-18, International Workshop on Rapid Methods and Automation in Microbiology, XI**, and **Mini-symposium July 11-12th** at Kansas State University. Contact Daniel Y.C. Fung, Director, Tel (913)532-5654 or FAX (913)532-5681, 207 Call Hall, KSU, Manhattan, KS 66506.
•**16-18, Texas Association of Milk, Food and Environmental Sanitarians** will hold a seminar entitled "Basic Pasteurization Course" will be held at the Le Baron Hotel, 1055 Regal Row, Dallas, TX. For more information contact Janie Park of TAMFES at (512)458-7281.
•**21-24, International Association of Milk, Food and Environmental Sanitarians 78th Annual Meeting** to be held at the Galt House, Louisville, KY. For more information contact Julie at (800)369-6337 or (800)284-6336 (Canada).

August

•**5-9, Biotechnology: Principles and Processes**, will be held at the Massachusetts Institute of Technology, Cambridge, MA. For more information, please contact the Director of Summer Session, MIT, Room E19-356, Cambridge, MA 02139.
•**12-15, 105th Annual International Meeting and Exposition of the Association of Official Analytical Chemists** will be held at The Pointe at South Mountain, Phoenix, Arizona. For more information contact the AOAC, Suite 400, 2200 Wilson Boulevard, Arlington, VA 22201-3301; (703)522-3032; FAX (703)522-5468.

September

•**10-11, Marketing Development Seminar** will be held at The Registry, Denver, CO. For more information contact the International Dairy Foods Association, 888 Sixteenth Street, NW, Washington, DC 20006; (202)296-4250.
•**10-12, Texas Association of Milk, Food and Environmental Sanitarians** will hold a seminar entitled "Special Problems in Milk Plants" at the Howard Johnson, Plaza South, IH 35 at Woodward, Austin, TX. For more information contact Janie Park of TAMFES at (512)458-7281.
•**24-26, New York State Association of Milk and Food Sanitarians 68th Annual Conference** will be held at the Sheraton Inn, Liverpool, NY (Syracuse). For more information contact Paul Dersam at (716)937-3432.
•**29-Oct. 4, 8th World Congress of Food Science and Technology**. The Westin Harbor Castle, Toronto, Canada. For further information, please write 8th World Congress, (IUFoST), 3340 Orlando Drive, Mississauga, Ontario, Canada L4V 1C7; or FAX (416)678-1229.

October

•**1-4, Canadian Institute of Public Health Inspectors Annual Conference**. For further information contact John Foruna, Public Health Inspector at Hamilton-Wentworth Regional Department of Public Health Services, P. O. Box 897, Hamilton, Ontario, Canada, L8N 3P6; (416)546-3570 or FAX (416)521-8093.
•**6-9, Annual Meeting and Convention: Milk Industry Foundation and International Ice Cream Association** will be held at the Marriott River Center, San Antonio, TX. For more information contact the International Dairy Foods Association, 888 Sixteenth Street, NW, Washington, DC 20006; (202)296-4250.
•**16-17, Annual Conference of the North Central Cheese Industries Association** will be held at the Earle Brown Center, University of Minnesota, St. Paul. For further information contact E. A. Zottola, Executive Secretary, NCCIA, P. O. Box 8113, St. Paul, MN 55108.
•**26-30, Food & Dairy Expo 91,** sponsored by Dairy & Food Industries Supply Association, to be held at the McCormick Place, Chicago. For more information contact DFISA, 6245 Executive Boulevard, Rockville, MD 20852-3938 (301)984-1444.

To insure that your meeting time is published, send announcements at least 90 days in advance to: IAMFES, 502 E. Lincoln Way, Ames, IA 50010-6666.

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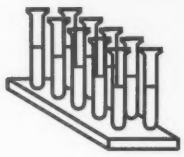

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